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United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with
United States Department
of Agriculture,
Forest Service,
Texas Agricultural
Experiment Station, and
Texas State Soil and Water
Conservation Board

Soil Survey of Wise County, Texas

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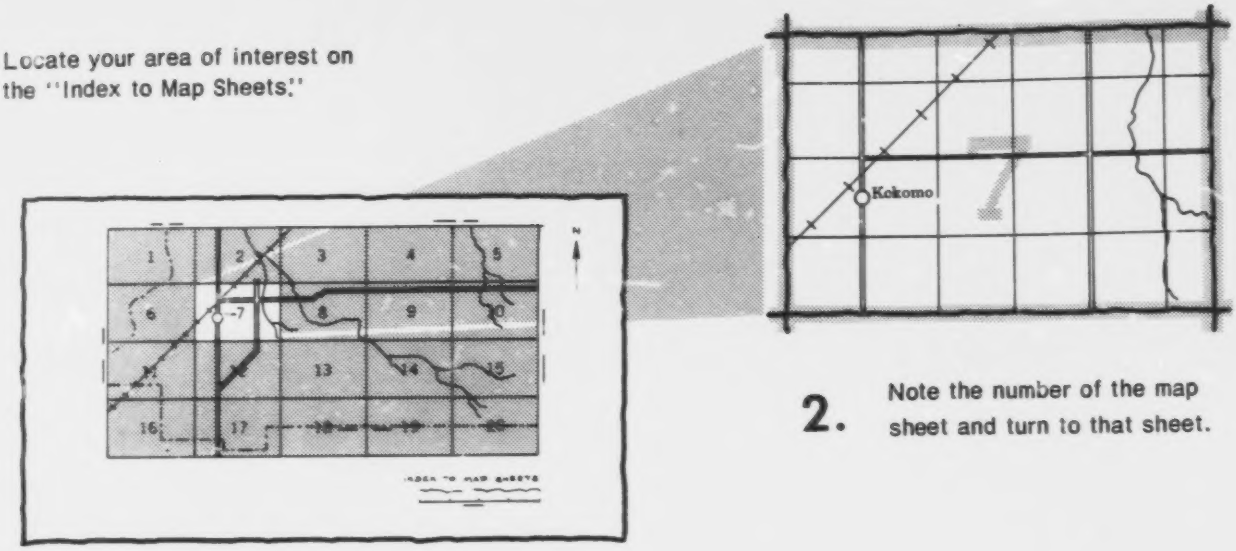
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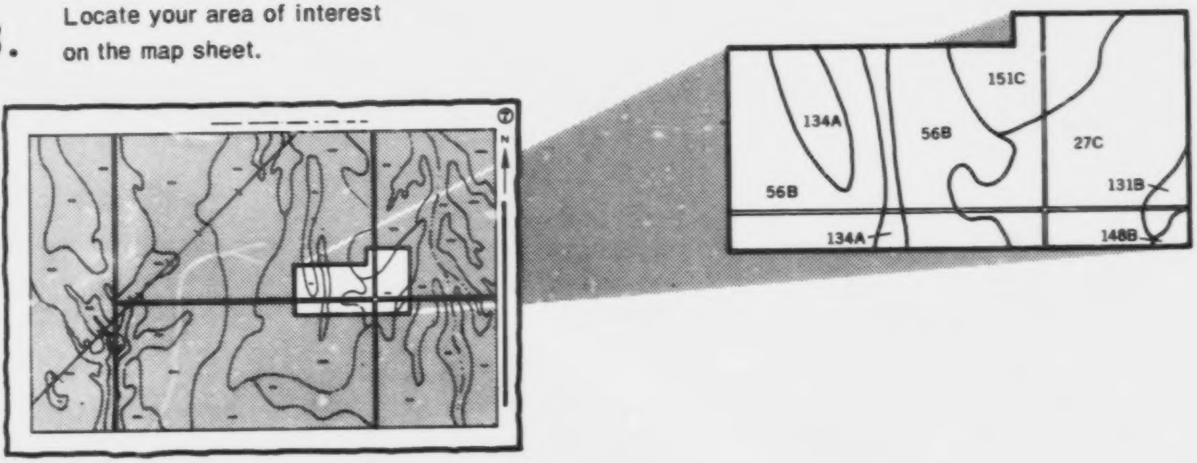
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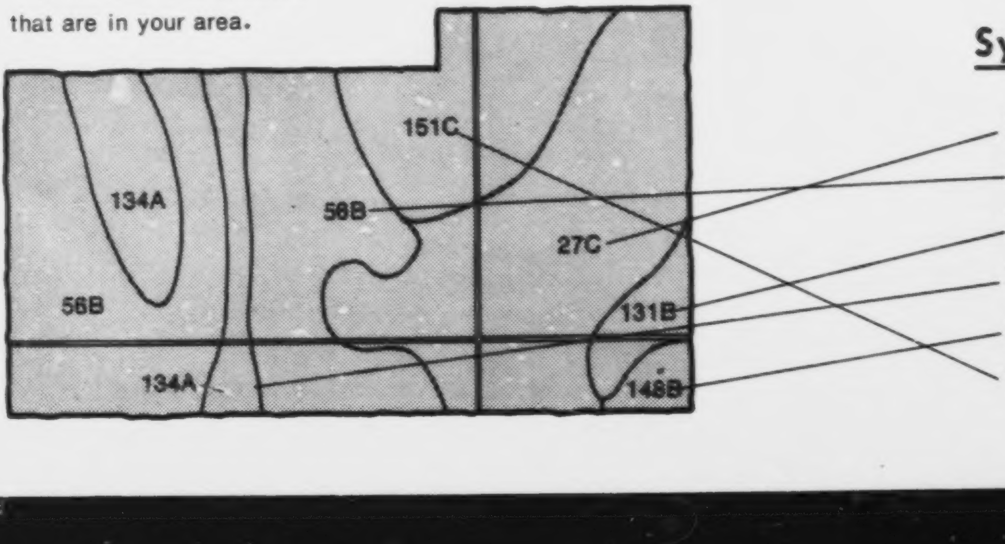
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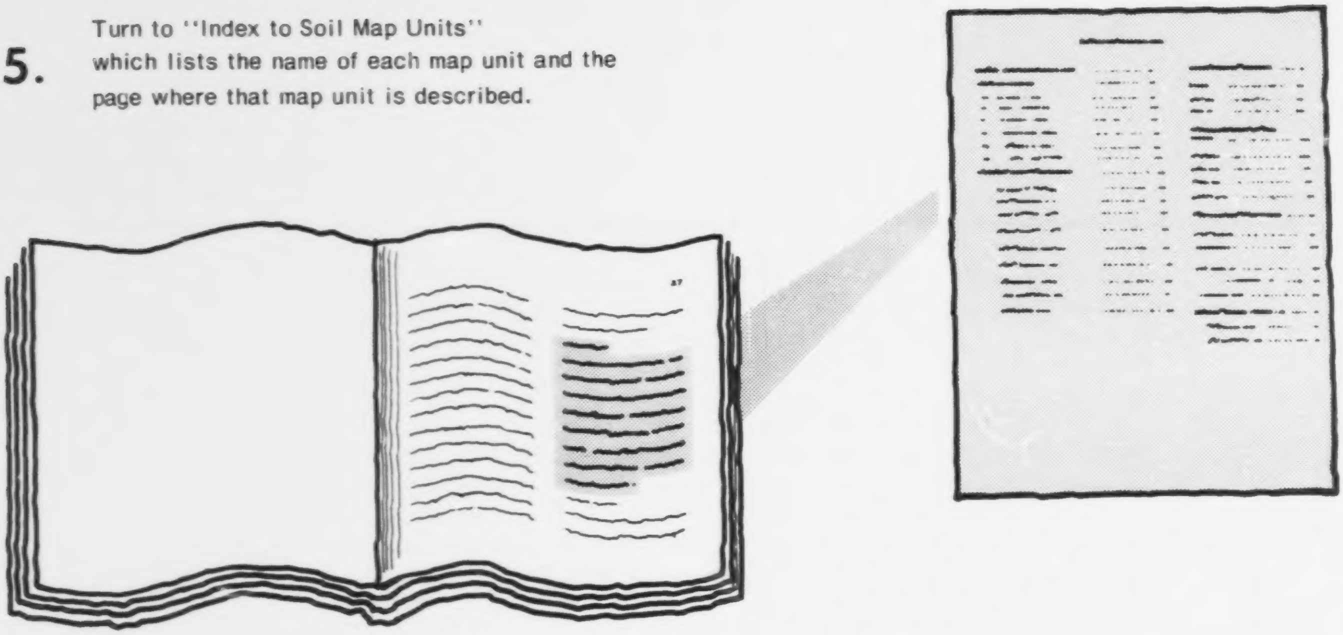
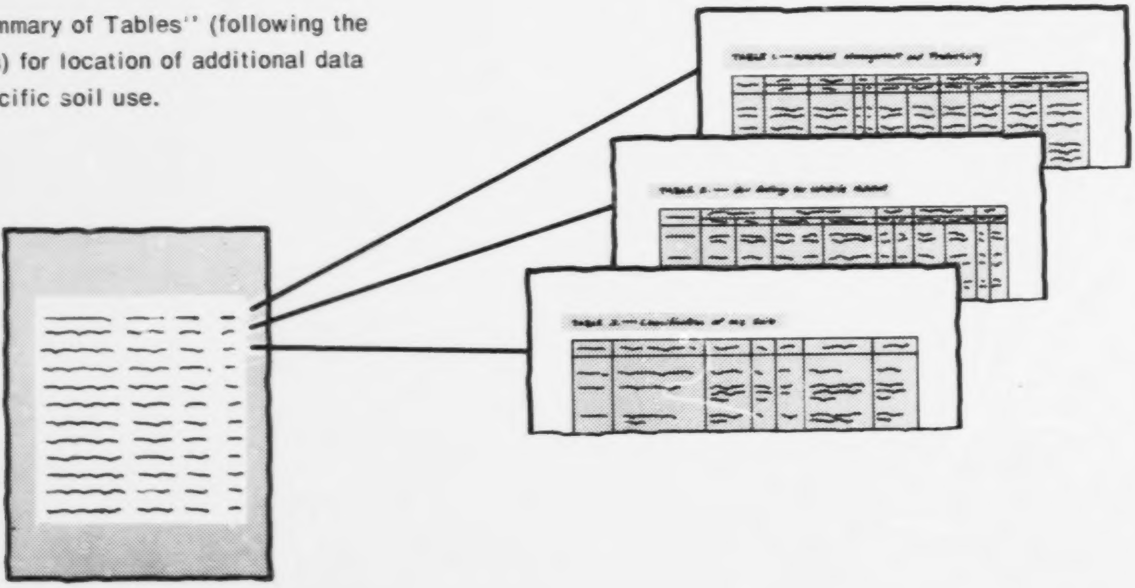
THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1983. Soil names and descriptions were approved in 1984. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1983. This soil survey was made cooperatively by the United States Department of Agriculture, Soil Conservation Service and Forest Service, the Texas Agricultural Experiment Station, and the Texas State Soil and Water Conservation Board. It is part of the technical assistance furnished to the Wise Soil and Water Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Soil Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: Well managed rangeland, mainly little bluestem grass, on Weatherford-Duffau complex, 3 to 8 percent slopes.

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Foreword

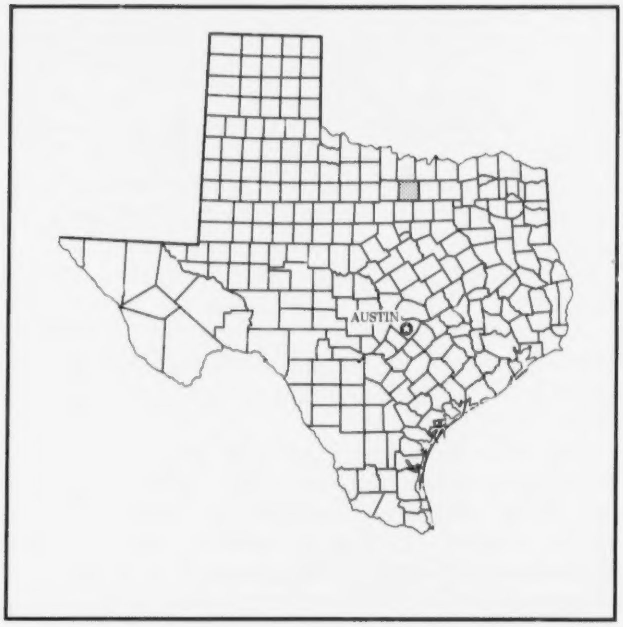
This soil survey contains information that can be used in land-planning programs in Wise County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Harry W. Oneth
State Conservationist
Soil Conservation Service



Location of Wise County in Texas.

Soil Survey of
Wise County, Texas

By Dennis D. Ressel, Soil Conservation Service

Soils surveyed by Dennis D. Ressel, Glen W. Dittmar, Edward W. Pauls,
William M. Risinger, and Dennis F. Clower, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service
In cooperation with
United States Department of Agriculture, Forest Service;
Texas Agricultural Experiment Station; and
Texas State Soil and Water Conservation Board

WISE COUNTY is in the north-central part of the state. It is square and has an area of about 922 square miles, or 590,063 acres. Decatur, the county seat, has a population of 4,104. The county population in 1980 was 26,575, an increase from the 1970 population of 19,687.

The county slopes mainly to the east and southeast. It is entirely within the Trinity River drainage system and is drained by the West Fork of the Trinity River and by Denton Creek. The topography is nearly level to hilly. The elevation ranges from 649 feet, the elevation of Eagle Mountain Lake, to 1,286 feet in the southwest part of the county.

Wise County is within three major land resource areas. The North Central Prairie Major Land Resource Area makes up about 10 percent of the county; the West Cross Timbers, 61 percent; and the Grand Prairie, 29 percent. Respectively, these major land resource areas are in the western, central, and eastern parts of the county.

About 48 soils are in Wise County. They range widely in texture, depth, reaction, natural drainage, and other characteristics. Generally, the soils that have a clay loam or clay surface layer formed from alkaline sediment under mid and tall grasses. These soils are common to the Grand Prairie Major Land Resource Area. Soils that have a loamy fine sand or fine sandy loam surface layer formed in acid or alkaline sediment under a savannah of oaks and mid and tall grasses. These soils are common to the West Cross Timbers and the North Central Prairie Major Land Resource Areas. Slope, depth to bedrock, the hazard of flooding, and natural fertility influence agricultural use.

Dairy farming, livestock production, and growing wheat, forage sorghum, grain sorghum, peanuts, pecans, and melons are the major agricultural enterprises. Horses, swine, poultry, alfalfa, and truck crops are also grown. The climate is generally favorable for cool-season crops. Because of high summer temperatures and periods of drought, growing crops during the warm season is risky and erratic. According to the latest inventory made by the Soil Conservation Service in 1983, about 59 percent of the county is rangeland, 25 percent is pasture and hayland, 11 percent is cropland, and 5 percent is in nonagricultural uses.

Oil and gas exploration, drilling, servicing, and gas processing are the major nonagricultural industries. Other industries include mining, crushing, and hauling limestone rock; mining and hauling sand and gravel; brick-making; tank manufacturing; and other small manufacturing and assembling industries. Coal was once mined near Bridgeport.

Shallow to deep wells provide water for home use, livestock, and small industries. Lake Bridgeport and Eagle Mountain Lake, the two largest lakes within the county, provide flood control, recreation, and part of the county's water supply. Soil Conservation Service flood prevention structures are in the county. The Lyndon B. Johnson National Grasslands, administered by the U.S. Forest Service, covers about 20,000 acres of the county.

Large urban centers that are southeast of Wise County have a major effect on the county's population and the size of farms and ranches. Large farms and ranches are being divided into smaller tracts and sold as homesites with acreage. These areas are scattered throughout the county but are mainly in the southern part.

Many soils in the county have limitations that require additional expense and special design for proper construction. These limitations are shrinking and swelling resulting from changes in moisture, shallow depth to bedrock, corrosivity to uncoated steel, slope, very slow permeability, and the hazard of flooding. However, most well drained and moderately well drained, loamy and sandy soils are well suited to urban development.

This is the first soil survey to be made for Wise County. The descriptions and names of soils in this soil survey do not fully agree with those on soil maps for adjacent counties. Differences are the result of better knowledge of, or extent of, the soils within the survey area.

General Nature of the Survey Area

This section provides general information on the history and settlement and the climate of Wise County.

History and Settlement

Sam Woody, a Tennessean, was the first settler to build a house in Wise County *(3)*. The house, built in 1854, was near Deep Creek about 9 miles south of Decatur. His first crop was wheat. Hunters had driven the buffalo to the west of Wise County, but antelope and prairie chicken still lived on the prairies. Deer, turkey, cougar, black bear, wolf, squirrel, and quail were abundant. A small band of Indians of the Delaware Tribes still lived in the county. They hunted and fished in the area until food became scarce.

Wise County was created from a part of Cooke County in 1856. It was named in honor of Henry A. Wise, a U.S. Senator from Virginia who favored Texas annexation. By 1861 the first courthouse was built in Decatur, which then was named Taylorsville.

The Butterfield Overland Mail Route and the Chisholm Trail passed through the county. In 1882, the Fort Worth and Denver Railroad was completed between Decatur and Fort Worth.

In the late 1880's, division of large landholdings into small farms began. Cotton became a leading cash crop that produced 40,000 bales in 1910. By 1920, serious erosion problems were evident. During the depression of the 1930's, the market value for crops dropped, much of the topsoil was gone, and gullying was rampant. Farmers moved away. The Bankhead-Jones Tenant Act of 1937 directed the Secretary of Agriculture to purchase tracts of abandoned or submarginal land and to develop a program of restoration. By the start of World War II almost 20,000 acres had been purchased. That acreage is now the Lyndon B. Johnson National Grasslands.

Climate

Prepared by the National Climatic Data Center, Asheville, North Carolina.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Bridgeport, Texas, in the period 1951 to 1980. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 45 degrees F, and the average daily minimum temperature is 31 degrees. The lowest temperature on record, which occurred at Bridgeport on January 23, 1966, is 1 degree. In summer the average temperature is 83 degrees, and the average daily maximum temperature is 97 degrees. The highest recorded temperature, which occurred at Bridgeport on June 29, 1980, is 115 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 28.86 inches. Of this, 17 inches, or 60 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 13 inches. The heaviest 1-day rainfall during the period of record was 5.74 inches at Bridgeport on October 4, 1959. Thunderstorms occur on about 44 days each year, and most occur in spring.

The average seasonal snowfall is 4 inches. The greatest snow depth at any one time during the period of record was 7 inches. On the average, only 1 day has at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 55 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 75 percent of the time possible in summer and 60 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 13 miles per hour, in spring.

Tornadoes and severe thunderstorms occur occasionally. These storms are local and of short duration, and the pattern of damage is variable and spotty.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material from which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, acidity, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area are generally collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or a building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Dominantly Gently Sloping to Sloping, Neutral to Slightly Acid Soils Formed in Material Weathered From Sandstones and Shales; on Upland and Terrace Savannahs

This broad grouping of map units consists of soils in the West Cross Timbers and North Central Prairie Major Land Resource Areas. Soils of the West Cross Timbers formed in weakly cemented sandstones and unconsolidated loamy material of the Cretaceous age. These soils are highly erodible. Soils of the North Central Prairie formed in Pennsylvanian clayey shales interbedded with harder sandstones. Sandstone escarpments are in places.

1. Duffau-Keeter-Weatherford

Deep, loamy and sandy, well drained soils underlain by weakly cemented sandstone or stratified loamy material; on uplands

These soils are on erosional uplands that have distinct drainage patterns. Slope ranges from 1 to 8 percent. The soils are underlain by weakly cemented sandstone or stratified loamy sediment that has high content of silt and very fine sand (fig. 1). Deep, vertical-walled gullies have formed in many areas of this map unit, mainly in areas that were row-cropped. The natural vegetation is a savannah of oaks that has an understory of mid and tall grasses.

This map unit makes up about 30 percent of the survey area. It is about 37 percent Duffau soils, 28 percent Keeter soils, 14 percent Weatherford soils, and 21 percent soils of minor extent.

Typically, Duffau soils have a very fine sandy loam surface layer about 16 inches thick. The surface layer is yellowish brown in the upper part and light brown in the lower part. In some areas, the surface layer is loamy fine sand. The subsoil to a depth of 80 inches is reddish sandy clay loam. The subsoil is underlain by stratified loamy sediment or weakly cemented sandstone. These soils are on low side slopes and concave foot slopes. Permeability is moderate, and the available water capacity is high.

Typically, Keeter soils have a very fine sandy loam surface layer about 7 inches thick. The surface layer is brown in the upper part and light brown in the lower part. The subsoil extends to a depth of 33 inches. The upper part is red clay loam, the middle part is reddish yellow clay loam that is mottled in shades of red and brown, and the lower part is reddish yellow and very pale brown, mottled very fine sandy loam that has fragments of weathered sandstone. The underlying material to a depth of 72 inches is stratified very pale brown and white weakly cemented sandstone (packsand). These soils are on ridgetops. Permeability is moderately slow, and the available water capacity is moderate.

Typically, Weatherford soils have a brown very fine sandy loam surface layer about 11 inches thick. The subsoil extends to a depth of 47 inches. It is red and yellowish red sandy clay loam. The underlying material is reddish yellow weakly cemented sandstone. These soils are on upper side slopes. Permeablity is moderate, and the available water capacity is moderate.

Of minor extent in this map unit are the deep Bastsil, Heaton, Patilo, Pulexas, Silawa, and Windthorst soils and the moderately deep Wise soils. The nearly level to gently sloping, sandy and loamy Bastsil soils and the gently sloping to sloping, loamy Silawa soils are on stream terraces. The gently sloping to strongly sloping, sandy Heaton and Patilo soils are on uplands that have only a few ill-defined drainageways. The nearly level, loamy Pulexas soils are on flood plains of small streams. The gently sloping, loamy Windthorst soils are on ridges and side slopes. The gently sloping to sloping, loamy Wise soils are on low hills and nose slopes.

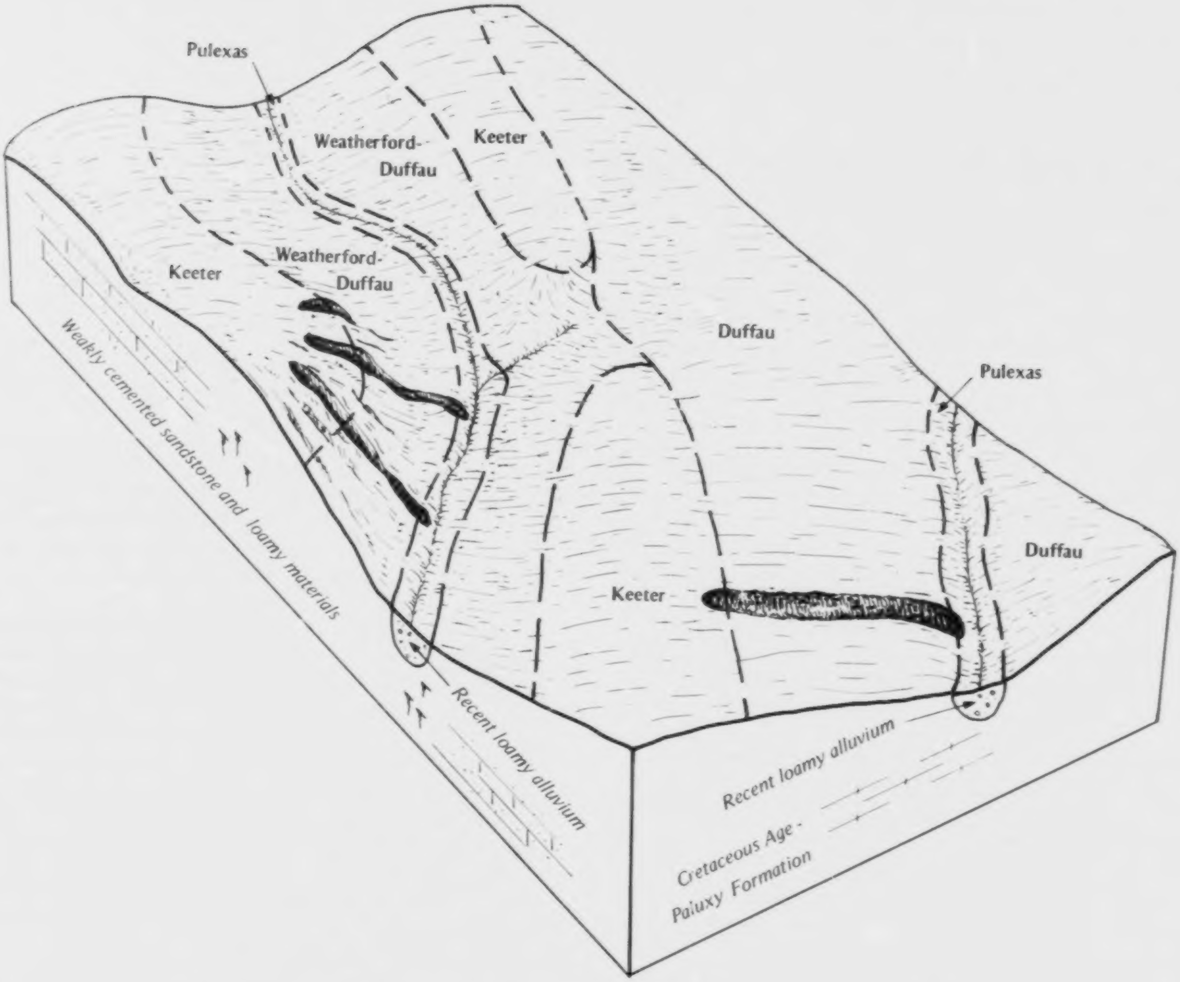

Pulexas
Weatherford-
Duffau
Keeter
Keeter
Weatherford-
Duffau
Duffau
Pulexas
Duffau
Keeter
Weakly cemented sandstone and loamy materials
Recent loamy alluvium
Recent loamy alluvium
Cretaceous Age -
Paluxy Formation

Figure 1.—Typical pattern of the Duffau-Keeter-Weatherford general soil map unit.

Most of the acreage in this map unit has been cleared and is used for improved pasture or as rangeland. Oaks and other woody vegetation are invading most rangeland. A few areas that have slope of less than 3 percent are used for crops and orchards.

Suitable pasture plants are improved bermudagrass, kleingrass, weeping lovegrass, and switchgrass. Some areas are planted to vetch or arrowleaf clover for additional forage early in spring. Wheat, oats, and rye are commonly used for cool-season pastures. Fertilizer, weed control, and controlled grazing are essential for high yields.

The main crops are forage sorghum, peanuts, grapes, nursery stock, tree fruits, and nuts. Truck crops are successfully grown on the gently sloping Duffau soils. Controlling erosion is the main concern in management. The hazards of water erosion and soil blowing are severe. Terrace construction is limited because these soils do not have suitable areas for dispersing terrace runoff water. However, most of the mechanical conservation work in the county is on the soils of this map unit. Drop inlets, consisting of small earthern structures that have a pipe through the dam, are used to safely lower the runoff water downslope to a stable level. Many gullied areas are shaped, partly smoothed, and planted to sod-forming grasses. Contour farming and crop residue left on or near the surface help control erosion. Cool-season legumes help control erosion and improve soil tilth. Natural fertility is low, and fertilizer is essential for high yields.

These soils have good potential for use as habitat for wildlife. The woody and herbaceous vegetation provide food and cover for deer, turkey, squirrel, dove, and quail. Small grains increase the year-long food supply.

The soils in this map unit are suited to most urban and recreational uses. Wooded areas are prized homesites. The moderately slow permeability is a limitation for septic tank absorption fields in the Keeter soils. The sandy surface layer is a limitation for recreational uses on some Duffau soils.

2. Windthorst-Chaney-Selden

Deep, loamy and sandy, moderately well drained soils underlain by stratified loamy and clayey material; on uplands

These soils are on erosional uplands that have distinct drainage patterns. Slope ranges from 1 to 6 percent. The soils are underlain by loamy and clayey sediment interbedded with thin layers of soft shale and sandstone (fig. 2). Gullies are in places, and most of the surface layer has been eroded from about one-third of the Windthorst soils. Wind has blown soil from many of the sandy cultivated fields. Edges of wooded areas and fence rows have low dunes of windblown sand. The natural vegetation is a savannah of oaks and an understory of mid and tall grasses. Much of the acreage in this map unit has been cleared, but many scattered wooded areas remain. Continuous overgrazing has caused the oaks to thicken and quality grasses to thin or disappear. Many old cultivated fields are now improved pasture or rangeland. A few areas that have slope of less than 3 percent are still farmed to row crops.

This map unit makes up about 19 percent of the survey area. It is about 27 percent Windthorst soils, 22 percent Chaney soils, 15 percent Selden soils, and 36 percent soils of minor extent.

Typically, Windthorst soils have a fine sandy loam surface layer about 10 inches thick that is yellowish brown in the upper part and light yellowish brown in the lower part. The subsoil extends to a depth of 45 inches. The upper part of the subsoil is reddish brown sandy clay that has reddish yellow and dark red mottles. The lower part is reddish yellow sandy clay loam that has red and brownish yellow mottles. The underlying material to a depth of 60 inches is light gray, massive clay loam that has mottles in shades of yellow and thin strata of weathered sandstone and soft shale. These gently sloping to sloping soils are on upland stream divides and their side slopes. Permeability is moderately slow, and the available water capacity is moderate.

Typically, Chaney soils have a loamy fine sand surface layer about 12 inches thick that is brown in the upper part and pale brown in the lower part. The subsoil extends to a depth of 46 inches. The upper part of the subsoil is yellowish brown sandy clay that has reddish yellow and grayish brown mottles. The middle part is

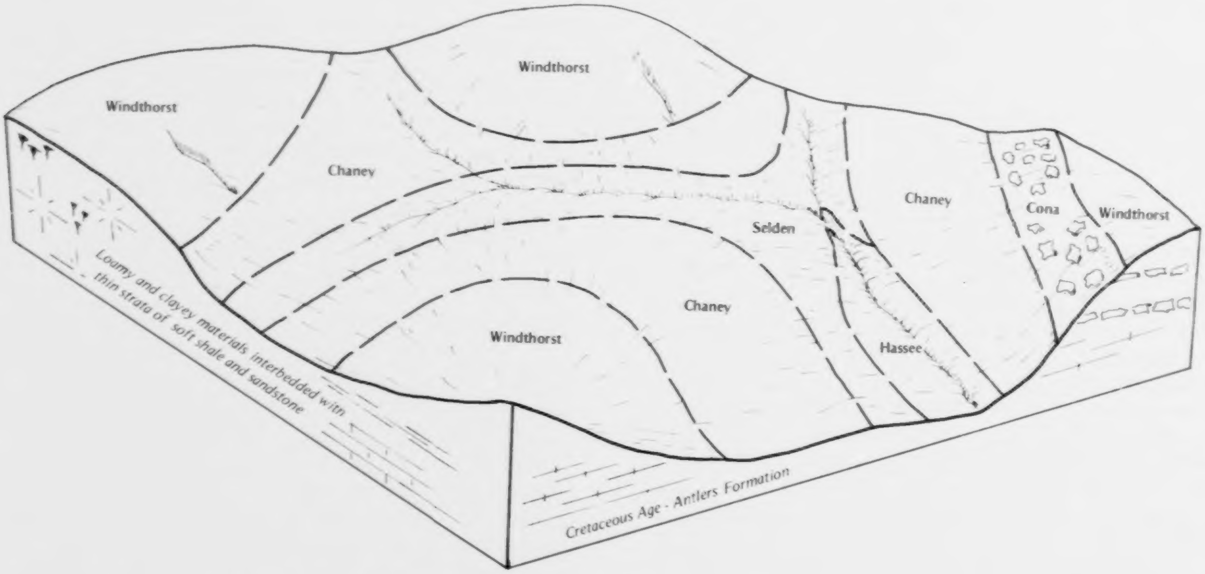

Windthorst
Windthorst
Chaney
Chaney
Selden
Cona
Windthorst
Chaney
Windthorst
Hassee
Loamy and clayey materials interbedded with thin strata of soft shale and sandstone
Cretaceous Age - Antlers Formation

Figure 2.—Typical pattern of the Windthorst-Chaney-Selden general soil map unit.

brownish yellow sandy clay that has red, yellowish red, and light gray mottles, and the lower part is brownish yellow sandy clay loam that has red and light gray mottles and a few concretions of calcium carbonate. The underlying material to a depth of 72 inches is light gray sandy clay loam interbedded with shaly and clayey material. It has red and brownish yellow mottles and concretions of calcium carbonate. These gently sloping soils are on upland stream divides, saddles, and their side slopes. Chaney soils are in slightly lower positions than Windthorst soils. Permeability is slow, and the available water capacity is moderate.

Typically, Selden soils have a loamy fine sand surface layer about 13 inches thick. The surface layer is in shades of brown. The subsoil to a depth of 70 inches is sandy clay loam. It is brownish yellow in the upper part and mottled in shades of yellow, red, brown, and gray in the lower part. These gently sloping soils are in slightly concave areas and are lower in elevation than the Windthorst and Chaney soils. Permeability is moderately slow, and the available water capacity is moderate.

Of minor extent in this map unit are the deep Anocon, Cisco, Cona, Duffau, Hassee, Nimrod, and Pulexas soils and the moderately deep Vernon and Wise soils. The gently sloping, loamy Anocon soils are on prairie outcrops. The gently sloping, sandy Cisco and Nimrod soils are on upland ridges and side slopes. The gently sloping to strongly sloping, loamy Cona soils are on stony ridges and hillsides. The gently sloping to sloping, loamy and sandy Duffau soils are on lower side slopes and concave foot slopes. The nearly level to gently sloping, loamy Hassee soils are in concave depressions. The nearly level, loamy Pulexas soils are on flood plains of small streams. The gently sloping to sloping, clayey Vernon soils are on prairie uplands. The gently sloping to sloping, loamy Wise soils are on low hills and nose slopes.

Most of the acreage in this map unit is rangeland and pastureland for beef and dairy stock. Most of the pasture is improved bermudagrass, but some is cultivated to small grains and forage sorghum. Most of the peanuts produced in Wise County are grown in these soils.

The sandy Chaney and Selden soils are well suited to peanuts and forage sorghums. Selden soils are also suited to orchards, vineyards, nursery stock, and truck crops. Soil blowing is a severe hazard on these soils. Terraces, contour farming, and grassed waterways control water erosion.

Improved bermudagrass and weeping lovegrass are well suited to the sandy soils. Kleingrass and old world bluestems are suited to the loamy and droughty Windthorst soils. Legumes, such as vetch and arrowleaf clover, are commonly used to extend the grazing season.

These soils have good potential for use as habitat for wildlife. Deer and turkey use the woody vegetation for food, cover, and protection. Small grains supplement the winter food supply.

The soils in this map unit are well suited to most urban and recreational uses. Steepness of slope, slow permeability in some areas, the sandy texture, and the hazard of erosion are limitations, but they can be overcome by good design and careful installation of structures.

3. Truce-Cona

Deep, loamy, well drained soils underlain by interbedded shaly clay or sandstone; on uplands

These loamy soils are on gently sloping to strongly sloping ridges, hillsides, and valleys (fig. 3). Slope ranges from 1 to 12 percent. The soils are underlain by shaly clay interbedded or capped with sandstone strata of various thickness. Sandstone fragments and boulders are on the surface of Cona soils.

Because of stones in the Cona soils and the droughty nature of the Truce soils, most areas of this map unit are used as rangeland. The natural vegetation is a post oak savannah that has an understory of mid and tall grasses. Most areas of the Truce soils have been cleared of oaks. Some areas were cultivated, eroded, and returned to rangeland. Mesquite and cactus are now invading. A few areas of Truce soils that have slope of less than 3 percent are cultivated.

This map unit makes up about 8 percent of the survey area. It is about 29 percent Truce soils, 28 percent Cona soils, and 43 percent soils of minor extent.

Typically, Truce soils have a dark brown fine sandy loam surface layer about 7 inches thick. The subsoil to a depth of 51 inches is clay. It is yellowish red in the upper part, dark yellowish brown in the middle part, and light yellowish brown in the lower part. Fragments of shale are in the middle and lower parts. The underlying material to a depth of 80 inches is light gray very shaly clay. These soils are on gently sloping concave ridges and side slopes. Permeability is slow, and the available water capacity is low.

Typically, Cona soils have a very stony sandy loam surface layer about 9 inches thick. The surface layer is brown in the upper part and pale brown in the lower part. Sandstone conglomerate fragments, mainly 6 to 60 inches across their long axis, are imbedded in the surface layer and cover about 15 percent of the surface. The subsoil is clay. It extends to a depth of 39 inches. The upper part is red, the middle part is reddish yellow mottled in red, and the lower part is brownish yellow. The underlying material to a depth of 60 inches is brownish yellow and reddish brown shaly clay that has a few light gray mottles. These gently sloping to strongly sloping soils are on narrow ridgetops and hillsides. Permeability is slow, and the available water capacity is moderate.

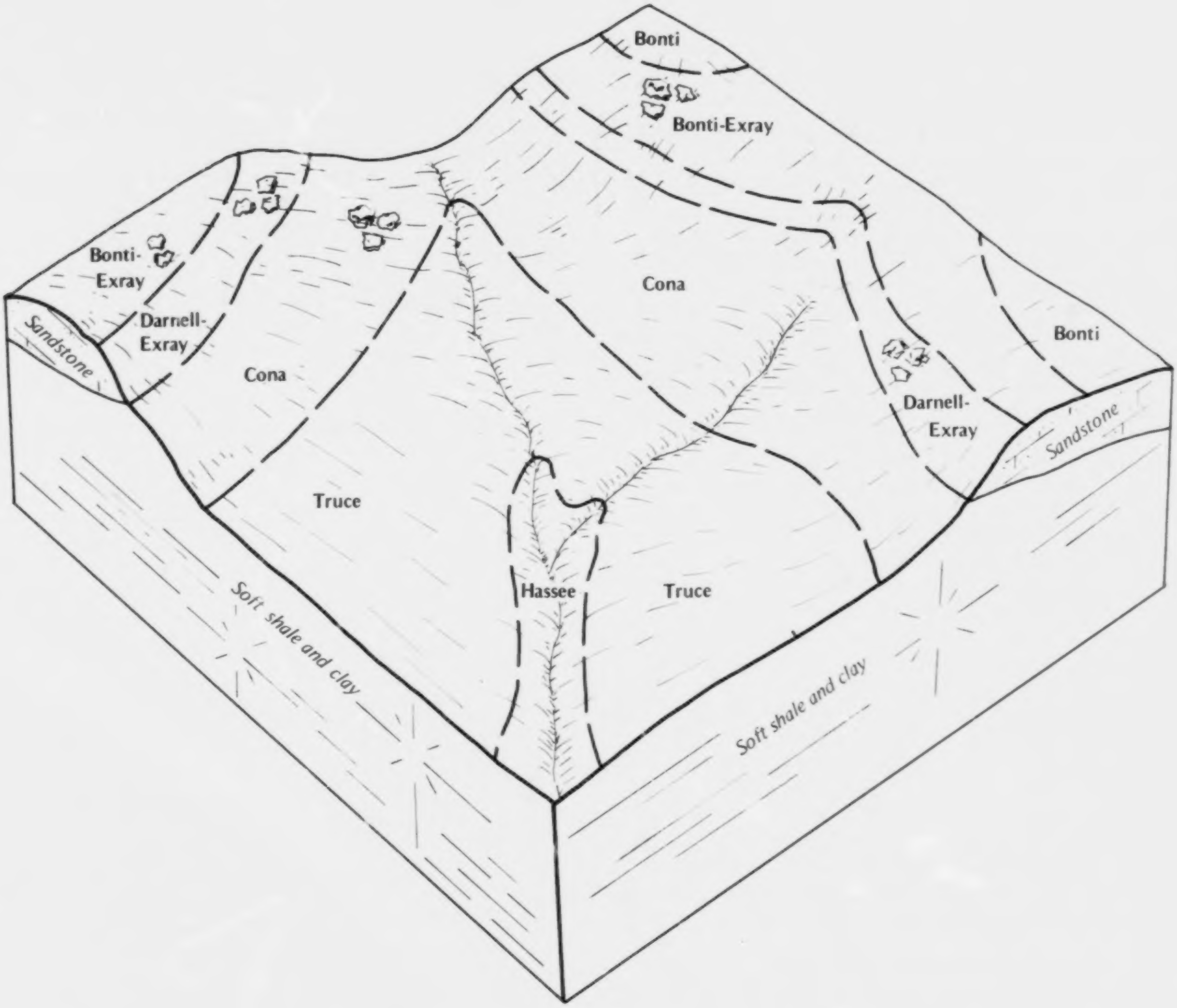

Bonti
Bonti-Exray
Bonti-Exray
Darnell-Exray
Sandstone
Cona
Cona
Bonti
Darnell-Exray
Sandstone
Truce
Hassee
Truce
Soft shale and clay
Soft shale and clay

Figure 3.—Typical pattern of the Truce-Cona general soil map unit.

Of minor extent in this map unit are the deep Balsora, Chaney, Hassee, Owens, Pulexas, Set, and Thurber soils; the moderately deep Bonti soils; and the shallow Darnell and Exray soils. The nearly level, loamy Balsora and Pulexas soils are on flood plains of small streams. The gently sloping to sloping, loamy Bonti soils are on ridges and side slopes. The gently sloping, sandy Chaney soils are in slightly concave valleys. The sloping to moderately steep, loamy and stony Darnell and Exray soils are on side slopes above drainageways. The nearly level to gently sloping, loamy Hassee soils are in depressions along small drainageways. The strongly sloping to steep, clayey and stony Owens and Set soils are on hillsides. The gently sloping, loamy Thurber soils are on upland foot slopes.

The soils in this map unit are used mainly as rangeland. They are mostly too stony and droughty for use as pasture or cropland.

Truce soils that are not eroded are moderately suited to pasture. Drought-tolerant species, such as kleingrass, old world bluestems, and weeping lovegrass, are suited, but production is limited.

The Truce soils are moderately suited to small grains and forage sorghums. Water erosion can be controlled by terracing and farming on the contour. Crop residue left on the surface helps slow runoff, conserve moisture, and lower soil temperature.

The soils in this map unit have good potential for use as habitat for wildlife. Dove, quail, turkey, and deer inhabit the area. Wooded areas provide food, cover, and protection. The winter food supply can be increased by planting small grains and cool-season legumes and by leaving harvested crop residue in the field.

These soils are moderately suited to urban and recreational uses. They are poorly suited to septic tank absorption fields because effluent percolates slowly through the clayey subsoil. The clayey lower layers also shrink and swell with changes in moisture content, which causes foundation problems for dwellings and low-cost streets and roads. Slow permeability, steepness of slope, and stones are limitations for recreational uses.

4. Bastsil-Silawa

Deep, loamy and sandy, well drained soils underlain by loamy and sandy material; on terraces

These soils are on low terraces of the larger streams. Slope ranges from 0 to 8 percent. These soils are commonly underlain by loamy, sandy, and gravelly ancient alluvial sediment (fig. 4). The natural vegetation is a savannah of oaks that has an understory of mid and tall grasses. In the few remaining wooded areas, continuous overgrazing has caused the oaks to increase and the grasses to decrease.

This map unit makes up about 5 percent of the survey area. It is about 54 percent Bastsil soils, 27 percent Silawa soils, and 19 percent soils of minor extent.

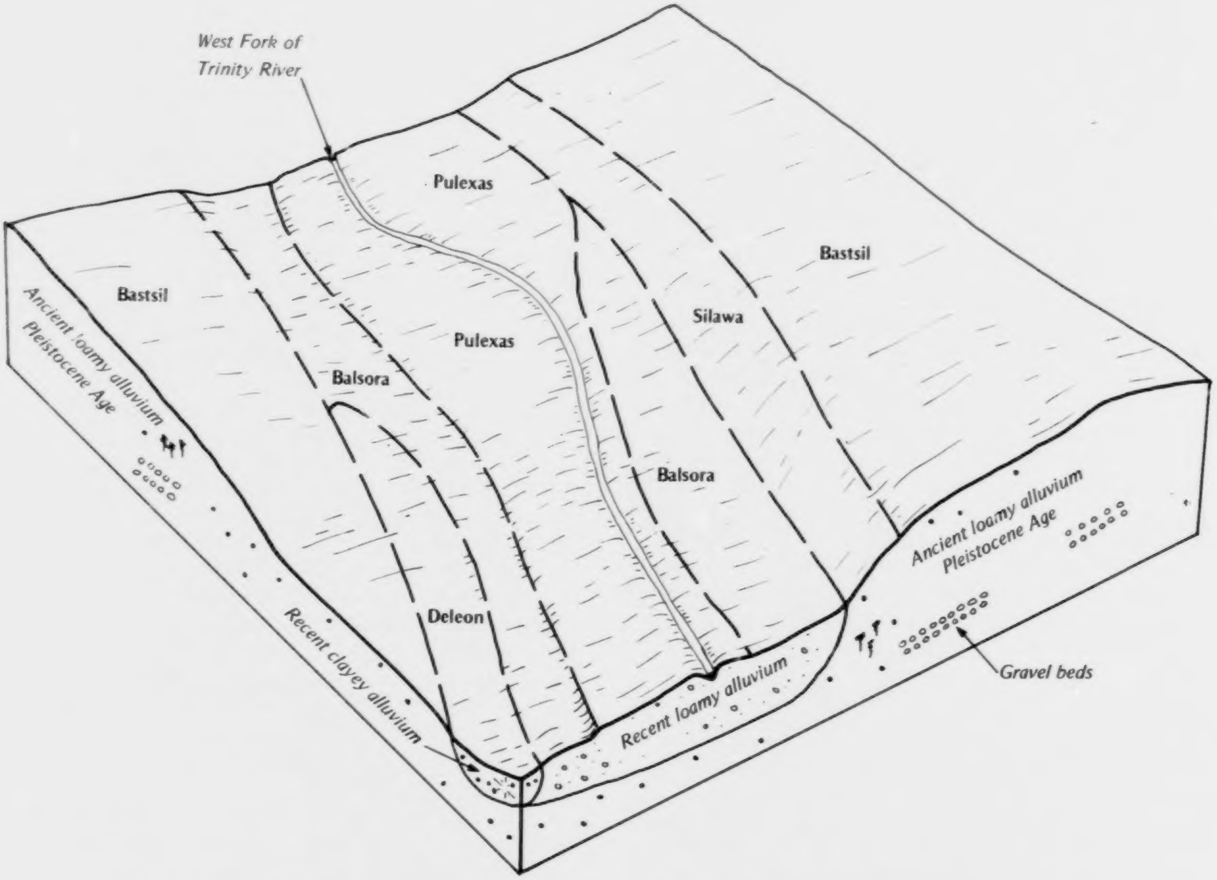

West Fork of Trinity River
Pulexas
Bastsil
Bastsil
Silawa
Pulexas
Balsora
Balsora
Deleon
Ancient loamy alluvium Pleistocene Age
Ancient loamy alluvium Pleistocene Age
Recent clayey alluvium
Recent loamy alluvium
Gravel beds

Figure 4.—Typical pattern of the Bastsil-Silawa and the Pulexas-Balsora-Deleon general soil map units.

Typically, Bastsil soils have a brownish fine sandy loam surface layer about 15 inches thick. In some areas, the surface layer is loamy fine sand. The subsoil to a depth of 80 inches is sandy clay loam. It is yellowish red in the upper part and red in the lower part. These nearly level to gently sloping soils are on stream terraces above flood plains of major streams. Permeability is moderate, and the available water capacity is moderate.

Typically, Silawa soils have a brownish fine sandy loam surface layer about 12 inches thick. The subsoil extends to a depth of 59 inches. It is red and yellowish red sandy clay loam in the upper part. The lower part is reddish yellow fine sandy loam. The underlying material to a depth of 80 inches is reddish yellow fine sandy loam. These gently sloping to sloping soils are on side slopes of stream terraces. Permeability is moderate, and the available water capacity is moderate.

Of minor extent in this map unit are the deep Arents, Hassee, Heaton, Patilo, Pulexas, and Venus soils. The gently sloping, loamy Arents soils are the soil material that remains after mining sand and gravel. The nearly level to gently sloping, loamy Hassee soils are in depressions. The gently sloping to strongly sloping, sandy Heaton and Patilo soils are on upland ridges and foot slopes. The nearly level, loamy Pulexas soils are on flood plains of small streams. The gently sloping to sloping, loamy and limy Venus soils are on stream terraces.

The soils in this map unit are used mainly as pasture and hayland. However, a considerable acreage of the Bastsil soils is cropland.

These soils are well suited to improved pasture. Yields of improved bermudagrass are high in most years, depending on the amount of rainfall. Weeping lovegrass and switchgrass are also suited.

Bastsil soils are well suited to peanuts, melons, sorghum, small grains, orchards, vineyards, and truck crops. Soil blowing is a severe hazard.

The soils in this map unit have good potential for use as habitat for wildlife. Deer and turkey use the woody vegetation for food and protection. Cropland areas provide additional food.

These soils are well suited to urban and recreational uses. Steepness of slope and the hazard of erosion are limitations in some areas, but good design and careful installation of urban structures help overcome the hazard of erosion. Slope and the sandy surface texture are limitations for some playground uses.

Dominantly Gently Sloping to Strongly Sloping, Neutral to Moderately Alkaline Soils Formed in Material Weathered From Limestones and Marls; on Upland Prairies

This broad grouping of map units consists of soils that are mainly in the Grand Prairie Major Land Resource Area. The Palopinto-Hensley-Lindy general soil map unit (map unit 7) is in the North Central Prairie Major Land Resource Area. Soils of the Grand Prairie formed mainly in Cretaceous age interbedded limestone and marl, resulting in grayish, calcareous soils. Soils of the North Central Prairie formed in Pennsylvania age material weathered from hard crystalline limestone, resulting in reddish, noncalcareous soils.

5. Sanger-Purves-Somervell

Very shallow to deep, clayey and loamy, well drained soils underlain by clays and interbedded limestones and marls

These calcareous soils are on prairie uplands. They are underlain by clay and interbedded limestone and marl (fig. 5). Slope ranges from 1 to 15 percent. Limestone bedrock is exposed in the channels of some of the natural drainageways. Most of the cultivated land in the survey area is in this map unit. Some areas that were previously cultivated are now used as pasture and hayland. Many of the rangeland areas still retain most of their high-quality mid and tall native grasses. A few hackberry, osageorange, and cedar elm trees are along drainageways and fence rows. In some areas where soils are not suitable for ponds, windmills are used to pump water from the Paluxy Aquifer.

This map unit makes up about 15 percent of the survey area. It is about 36 percent Sanger soils, 14 percent Purves soils, 9 percent Somervell soils, and 41 percent soils of minor extent.

Typically, Sanger soils have a very dark grayish brown and dark grayish brown clay surface layer about 24 inches thick. To a depth of 70 inches, the subsoil is clay. The upper part is grayish brown, and the lower part is light olive brown mottled in shades of yellow. The subsoil is underlain by clay. These deep, gently sloping to strongly sloping soils are on ridgetops, side slopes, and valley fills. Permeability is very slow, and the available water capacity is high.

Typically, Purves soils have a surface layer that is about 15 inches thick to limestone. The surface layer is very dark gray clay and very dark grayish brown very gravelly clay. It is underlain by fractured limestone interbedded with clayey marl. These shallow, gently sloping soils are on ridgetops and side slopes. Permeability is moderately slow, and the available water capacity is very low.

Typically, Somervell soils have a dark brown very gravelly loam surface layer about 10 inches thick. The surface layer is about 37 percent limestone gravel and 5 percent limestone cobbles. The subsoil extends to a depth of 37 inches. The upper part of the subsoil is brown very gravelly loam that is about 50 percent shell and limestone fragments mostly less than 8 inches across the long axis. The lower part is light yellowish brown very gravelly loam that has about 40 percent weathered limestone fragments and about 20 percent platy marly material. The underlying material to a depth

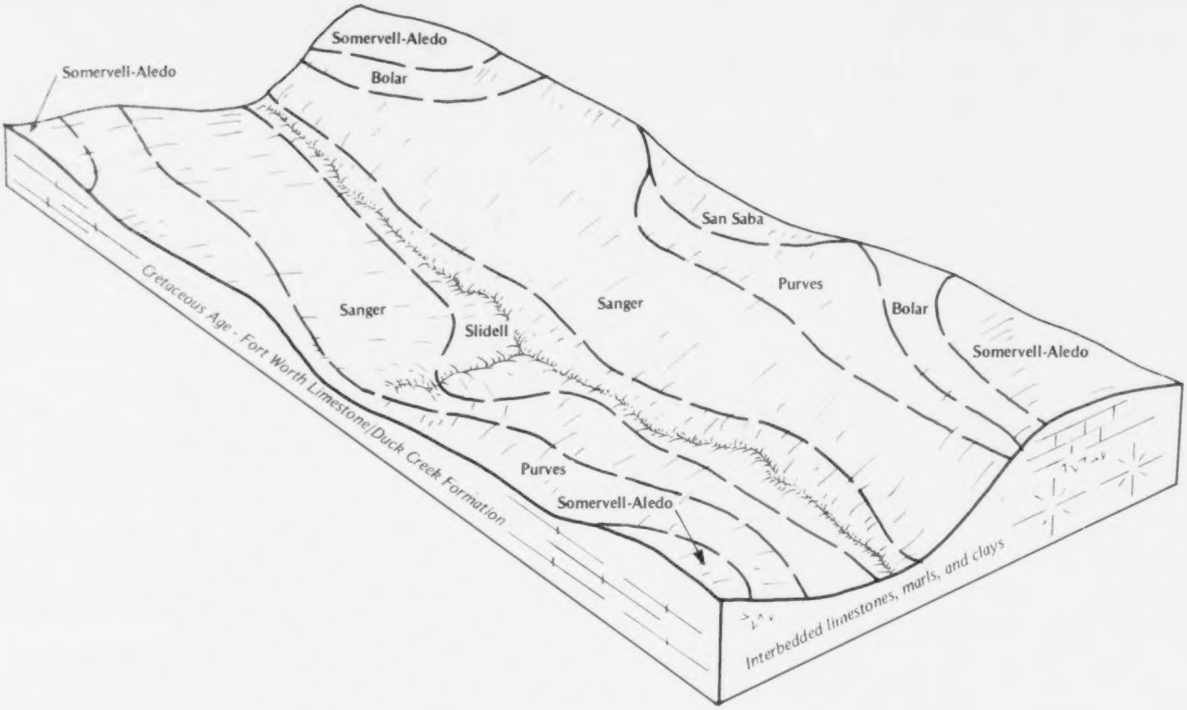


Figure 5.—Typical pattern of the Sanger-Purves-Somervell general soil map unit.

of 45 inches is coarsely fractured limestone bedrock interbedded with layers of weakly cemented limestone and loamy and clayey marl. These moderately deep, gently sloping to sloping soils are on upland ridges and side slopes. Permeability is moderate, and the available water capacity is low.

Of minor extent are the Aledo, Bolar, Frio, Medlin, Mingo, San Saba, Slidell, and Speck soils. The very shallow and shallow, gently sloping to sloping, loamy and gravelly Aledo soils are on ridgetops. The moderately deep, gently sloping, loamy Bolar soils are on ridges and side slopes. The deep, nearly level, loamy Frio soils are on flood plains of small streams. The deep, sloping to moderately steep, clayey and stony Medlin soils and the moderately deep, gently sloping, loamy Mingo soils are on side slopes. The moderately deep, gently sloping, clayey San Saba soils are on concave uplands. The deep, nearly level to gently sloping, clayey Slidell soils are in upland valley fill areas. The shallow, nearly level to gently sloping, loamy Speck soils are in concave parts of ridgetops.

Many of the clayey soils in this map unit that have slope of less than 5 percent are cultivated. The deep Sanger soils are well suited to warm-season crops, such as forage sorghum and grain sorghum. The shallow Purves soils are best suited to cool-season crops, such as small grains. The main objectives in management are controlling erosion and maintaining soil tilth.

The Sanger soils are well suited to pasture. Good yields of improved bermudagrass, kleingrass, sweetclover, and vetch are obtained most years. The Purves and Somervell soils are only moderately suited to pasture because they are droughty or gravelly.

Because cover is not available for wildlife, the soils in this map unit are restricted for use as habitat for wildlife. Some quail and dove inhabit areas of these soils.

The soils in this map unit are moderately suited to most urban uses. Shrinking and swelling, corrosivity, depth to limestone, and permeability are limitations, but they can be partly overcome by good design and careful installation of structures.

These soils are poorly suited to recreational uses because of the moderate to very slow permeability, small stones, and the clayey surface layer that has deep, wide cracks when dry and is sticky when wet.

6. Venus-Aledo-Somervell

Very shallow to deep, loamy, well drained soils underlain by interbedded limestone and marl or loamy material

These calcareous soils are on ridges, hill slopes, and foot slopes (fig. 6). The Aledo and Somervell soils are underlain by fractured limestone interbedded with marl and shaly clay. The Venus soils formed in sediment that weathered from limy material and weakly cemented sandstone. Some stony hill slopes have exposed beds of limestone bedrock. Thin bands of limestone near the surface give these hill slopes a benched or terraced appearance. Windmills provide water from the Paluxy Formation where soils are not suited to ponds. Slope ranges from 1 to 20 percent.

This map unit makes up about 12 percent of the survey area. It is about 30 percent Venus soils, 16 percent Aledo soils, 14 percent Somervell soils, and 40 percent soils of minor extent.

Typically, Venus soils have a dark brown loam surface layer about 14 inches thick. The subsoil to a depth of 70 inches is sandy clay loam in shades of brown. It has threads and concretions of calcium carbonate. These deep, nearly level to sloping soils are on foot slopes and in valley fill areas. Permeability is moderate, and the available water capacity is high.

Typically, Aledo soils have a surface layer about 18 inches thick underlain by hard limestone bedrock. The surface layer is dark brown gravelly loam and very gravelly loam. It is about 20 percent gravel and 5 percent cobbles in the upper part. In the lower part, it is

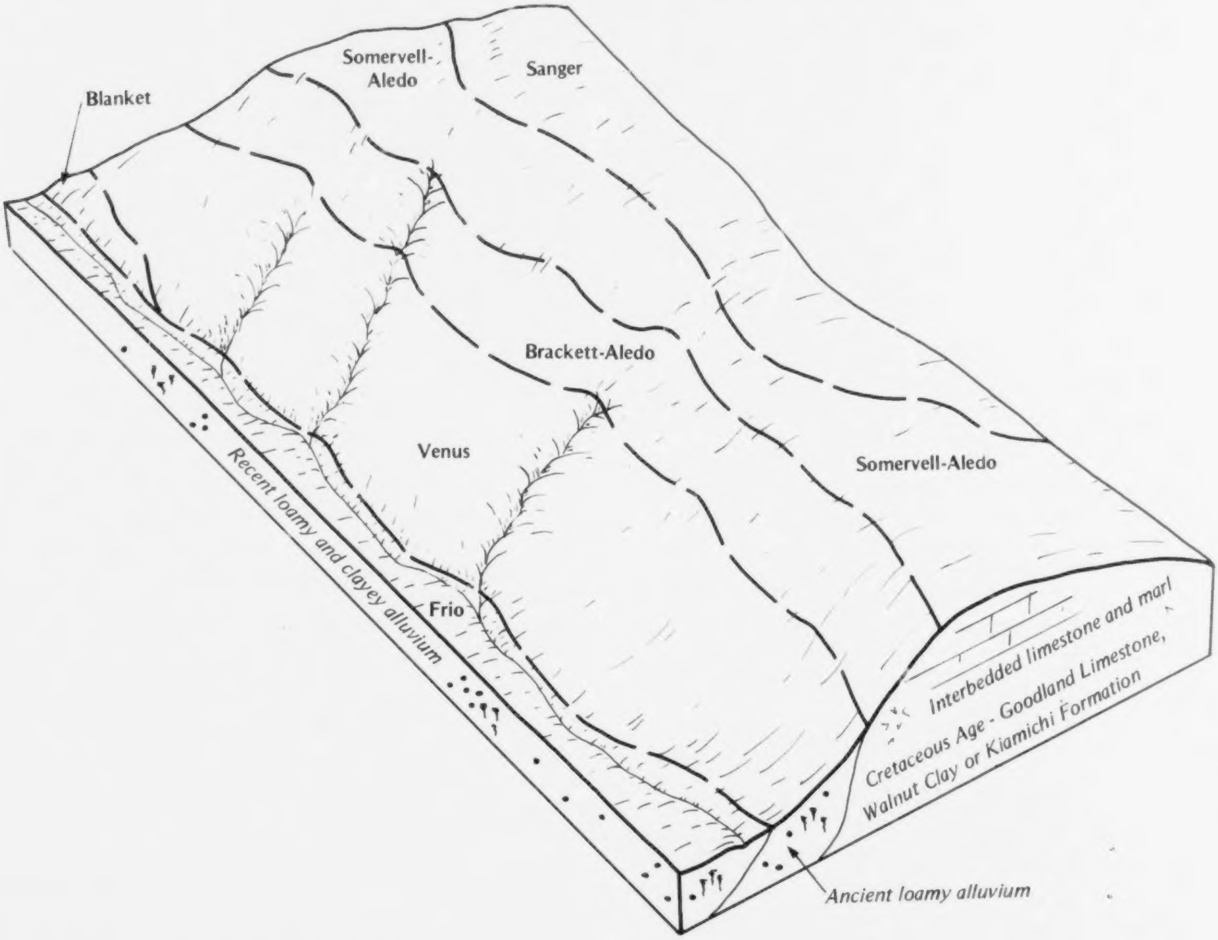

Somervell-Aledo
Sanger
Blanket
Brackett-Aledo
Venus
Somervell-Aledo
Frio
Recent loamy and clayey alluvium
Interbedded limestone and marl
Cretaceous Age - Goodland Limestone, Walnut Clay or Kiamichi Formation
Ancient loamy alluvium

Figure 6.—Typical pattern of the Venus-Aledo-Somervell general soil map unit.

about 65 percent shell and limestone fragments mostly less than 6 inches across the long axis. The hard limestone bedrock is coarsely fractured and interbedded with weakly cemented limestone and clayey marl. These very shallow and shallow soils are on gently sloping to moderately steep ridges and side slopes. Permeability is moderate, and the available water capacity is very low.

Typically, Somervell soils have a dark brown very gravelly loam surface layer about 10 inches thick. The surface layer is about 37 percent gravel and 5 percent cobbles. The subsoil to a depth of 37 inches is brown and light yellowish brown very gravelly loam. The upper part of the subsoil is about 50 percent shell and limestone fragments mostly less than 8 inches across the long axis, and the lower part is about 40 percent weathered limestone fragments and about 20 percent platy marl. The underlying material to a depth of 45 inches is coarsely fractured limestone bedrock interbedded with layers of weakly cemented limestone and loamy and clayey marl. These moderately deep soils are on gently sloping to sloping upland ridges and side slopes. Permeability is moderate, and the available water capacity is low.

Of minor extent are the Blanket, Brackett, Frio, Ponder, and Sanger soils. The deep, gently sloping, loamy Blanket and Ponder soils are on upland side slopes and foot slopes. The deep, sloping to moderately steep, loamy Brackett soils are on hillsides. The deep, nearly level, loamy Frio soils are on flood plains of small streams. The deep, gently sloping to moderately steep, clayey Sanger soils are on upland foot slopes and side slopes.

Because the soils are shallow, stony, and sloping, nearly all areas of this map unit are used as rangeland. The native vegetation is high quality mid and tall grasses. Live oak, pecan, hackberry, and cedar elm trees are common along drainageways. In some places, the Aledo soils are scraped or mined for limestone and shell fragments for road material. A few of the less sloping areas of Venus soils are used as pasture or cropland.

The less sloping areas of Venus soils are well suited to pasture and cropland. Generally, the other soils in this map unit are poorly suited to these uses. Gravel, shallow root zone, droughtiness, and steepness of slope are limitations.

The potential for use of the soils in this map unit as habitat for wildlife cover is lowered because cover is not available. Deer and quail inhabit areas of these soils.

The soils in this map unit are moderately suited to urban uses. Depth to limestone, low strength as it affects local roads and streets, and steepness of slope are the main limitations. Where slope is not so steep, the limitations can be overcome by good design and proper installation of structures.

These soils are poorly suited to most recreational uses. Depth to bedrock, small stones, and steepness of slope are limitations.

7. Palopinto-Hensley-Lindy

Very shallow to moderately deep, loamy, well drained soils underlain by limestone

These noncalcareous soils are on uplands that are underlain by hard crystalline limestone (fig. 7). In many areas the limestone forms cuestas that break into steep, stony and clayey soils. Slope ranges from 1 to 8 percent.

This map unit makes up about 3 percent of the county. It is about 28 percent Palopinto soils, 22 percent Hensley soils, 12 percent Lindy soils, and 38 percent soils of minor extent.

Typically, Palopinto soils have a surface layer 15 inches thick underlain by coarsely fractured, indurated limestone. The surface layer is silty clay loam in shades of brown. It is 25 to 90 percent limestone fragments about 6 to 48 inches across. These very shallow to shallow soils are on gently sloping to sloping, stony uplands. Permeability is moderate, and the available water capacity is very low.

Typically, Hensley soils have a dark brown very stony loam surface layer about 4 inches thick. The surface layer has about 20 percent gravel, cobbles, and stones of limestone on the surface and imbedded in this horizon. The subsoil extends to a depth of 18 inches. It is red and dark red clay loam. The underlying material is very hard, fractured limestone that has reddish clay and roots in the fractures. These shallow soils are on gently sloping uplands. Permeability is slow, and the available water capacity is very low.

Typically, Lindy soils have a reddish brown loam surface layer 6 inches thick. The subsoil extends to a depth of 24 inches. It is reddish brown clay loam in the upper part and clay in the lower part. The underlying material to a depth of 40 inches is hard limestone that is fractured in the upper few inches. These moderately deep soils are on gently sloping uplands. Permeability is slow, and the available water capacity is low.

Of minor extent in this map unit are the Bonti, Owens, Set, and Truce soils and areas of pits and quarries. The moderately deep, gently sloping to sloping, loamy Bonti soils are on ridges and side slopes underlain by sandstone. The deep, strongly sloping to steep, clayey and stony Owens and Set soils are on hillsides. The deep, gently sloping, loamy Truce soils are on ridges and hillsides. Pits and quarries are open limestone mines.

Stoniness, soil depth, and very low available water capacity limit the use of the soils in this map unit mainly to rangeland. Some areas are mined for limestone. Some areas are also used for certain kinds of recreation and wildlife.

Most soils in this map unit are used as rangeland because they are dominantly stony and very shallow and

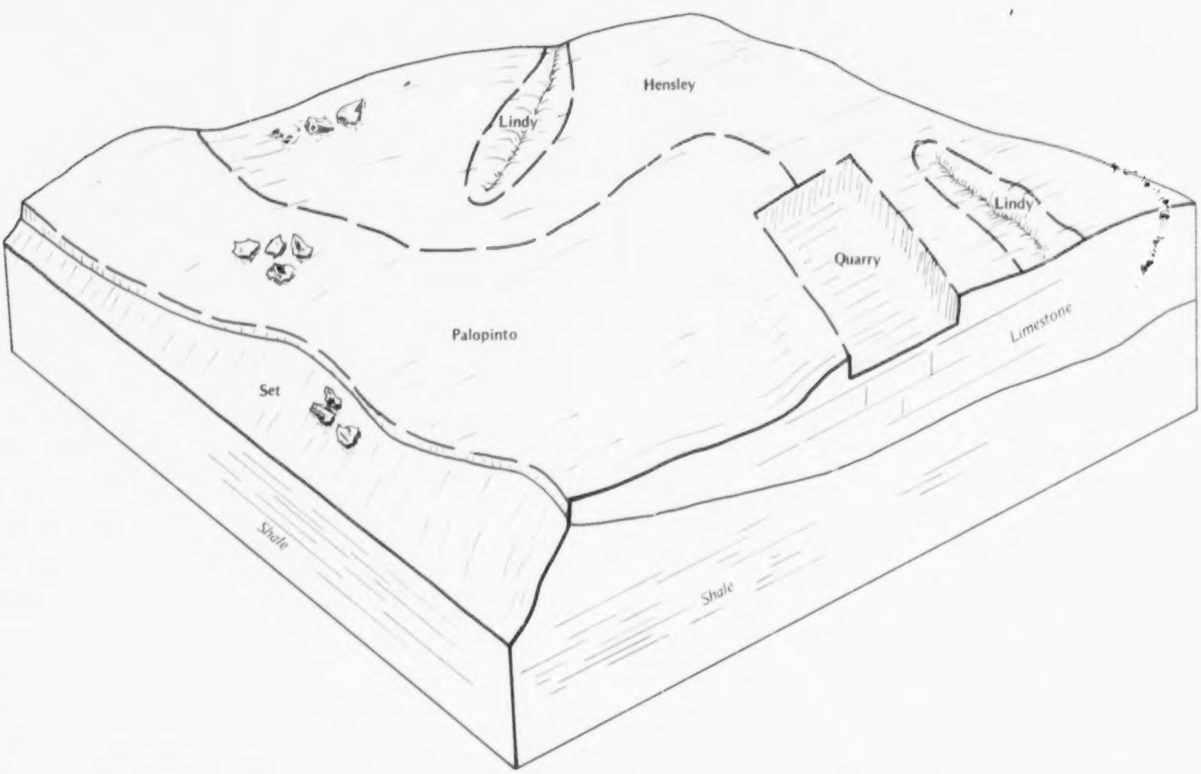


Figure 7.—Typical pattern of the Palopinto-Hensley-Lindy general soil map unit.

shallow. The native vegetation was a mixture of mid and tall grasses, but heavy continuous grazing has deteriorated most of the area. Tall grasses are in only a few places. A mixture of short to mid grasses, poor quality forbs, trees, and brush now grow in their place.

Lindy soils are moderately suited to pasture and cropland, but little acreage is in these uses.

The soils in this map unit have fair potential for use as habitat for wildlife. Deer, turkey, quail, and dove inhabit the area.

These soils are poorly suited to urban and recreational uses. Stoniness and depth to hard limestone are limitations.

Dominantly Nearly Level, Neutral to Moderately Alkaline Soils Formed in Alluvium; on Flood Plains

This grouping of map units consists of soils that are along the major streams. The soils formed from relatively recent sediment carried by runoff waters from the watersheds and deposited on the flood plain.

8. Pulexas-Balsora-Deleon

Deep, loamy and clayey, well drained and moderately well drained soils underlain by loamy and clayey alluvium

These soils are on flood plains of the West Fork of the Trinity River, Big Sandy Creek, the upper part of Denton Creek, and some tributaries of these streams. They formed in loamy and clayey alluvium washed from the nearby erosional uplands (see fig. 4). Most soils on the Denton Creek flood plain are protected from frequent flooding by floodwater retaining structures. A few structures have been built on Big Sandy Creek, but more are needed before flooding can be controlled. Lake Bridgeport provides some protection from frequent flooding on the upper part of the West Fork of the Trinity River. The natural vegetation is an overstory of oak, elm, hackberry, pecan, and willow and an understory of mid and tall grasses.

This map unit makes up about 7 percent of the survey area. It is about 55 percent Pulexas soils, 33 percent Balsora soils, 9 percent Deleon soils, and 3 percent soils of minor extent.

Typically, Pulexas soils have a light yellowish brown very fine sandy loam surface layer about 7 inches thick. The underlying material to a depth of 61 inches is light yellowish brown and brown very fine sandy loam that has thin strata of loam. A buried layer of brown loam extends to a depth of 72 inches. The Pulexas soils are well drained. Permeability is moderately rapid, and the available water capacity is moderate.

Typically, Balsora soils have a yellowish brown silt loam surface layer about 6 inches thick. The underlying material extends to a depth of 52 inches. The upper part is stratified brown and light yellowish brown silt loam, and the lower part is dark brown silty clay loam that has common strata of light yellowish brown loam and silt loam. A buried layer of dark grayish brown silty clay is below a depth of 52 inches. The Balsora soils are well drained. Permeability is moderate, and the available water capacity is high.

Typically, Deleon soils are dark grayish brown silty clay in the upper part and dark brown silty clay in the middle part. The lower part to a depth of 80 inches is an old buried surface layer of very dark grayish brown silty clay loam. The Deleon soils are moderately well drained. Permeability is slow, and the available water capacity is high.

Of minor extent in this map unit are Frio, Trinity, and Westfork soils. These soils are on flood plains. They are deep and nearly level. The loamy Frio soils and the clayey Westfork soils are well drained. The clayey Trinity soils are somewhat poorly drained.

The soils in this map unit that are protected from frequent flooding are used for crops, pasture, hay, or pecan orchards. Because of the deep, fertile soils, some of the frequently flooded areas are planted to forage sorghums after most seasonal flooding has ended. The soils subject to frequent flooding are used as rangeland, pasture, hayland, or pecan orchards.

The occasionally flooded Pulexas and Balsora soils are well suited to use as cropland. They are well suited to small grains, peanuts, melons, and sorghums. Alfalfa is grown on some of the Balsora soils. These soils are well suited to pecan trees. The frequently flooded soils are poorly suited to cultivated crops.

The soils in this map unit are well suited to pasture. Improved bermudagrass is the major grass. Some areas of these soils are overseeded with vetch or arrowleaf clover for cool-season grazing.

These soils have good potential for use as habitat for wildlife. All kinds of wildlife common to the survey area use various parts of this map unit. The tall trees, brushy understory, sloughs, and cropland areas provide food and cover for wildlife.

The soils in this map unit are poorly suited to urban uses because of flooding.

9. Frio-Trinity

Deep, loamy and clayey, well drained and somewhat poorly drained soils underlain by loamy and clayey sediment

These soils are on flood plains of the lower part of Denton Creek and its tributaries. They formed in loamy and clayey alluvium derived from the nearby calcareous uplands. Most of these soils are protected from frequent flooding by floodwater retaining structures and the channeled and leveed Denton Creek. Many native pecan trees are along stream channels, and a few are scattered throughout the flood plains.

This map unit makes up about 1 percent of the survey area. It is about 57 percent Frio soils, 42 percent Trinity soils, and about 1 percent soils of minor extent.

Typically, Frio soils have a surface layer about 40 inches thick. It is dark grayish brown silty clay loam in the upper part, very dark grayish brown silty clay in the middle part, and dark grayish brown silty clay in the lower part. The subsoil to a depth of 80 inches is grayish brown and brown clay loam that has threads and concretions of calcium carbonate. Frio soils are well drained. Permeability is moderately slow, and the available water capacity is high.

Typically, Trinity soils are dark gray and very dark gray clay to a depth of 80 inches. They have concretions of calcium carbonate. These soils are somewhat poorly drained. Permeability is very slow, and the available water capacity is high.

Balsora soils on flood plains are in this map unit, but they are of minor extent. These deep, nearly level, loamy soils are well drained.

Most areas of the soils in this map unit have been cleared of timber and are now used for crops, pasture, or hay.

The soils in this map unit are well suited to use as cropland. They produce high yields of grain sorghum and forage sorghum. The well drained Frio soils are also suited to alfalfa, small grains, and pecan orchards.

These soils are well suited to pasture. Improved bermudagrass and vetch are commonly grown. Grazing when the soil is wet causes soil compaction.

These soils have good potential for use as habitat for wildlife. Sloughs, tall trees, and brushy understory provide food and resting areas for wildlife. Cropland areas increase the food supply.

The soils in this map unit are poorly suited to urban uses because of flooding.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Duffau loamy fine sand, 1 to 5 percent slopes, is one of several phases in the Duffau series.

Some map units are made up of two or more major soils. These map units are called soil complexes, soil associations, or undifferentiated groups.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Somervell-Aledo complex, 1 to 8 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Pulexas soils, frequently flooded, is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, quarries, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

AnC—Anocon loam, 2 to 5 percent slopes. This soil is deep and gently sloping. It is on stream divides and convex side slopes. The mapped areas are irregularly shaped to oblong and range from 10 to about 60 acres. Deep drainageways dissect many areas. Slope averages about 4 percent.

Typically, this soil has a neutral, dark brown loam surface layer about 7 inches thick. The subsoil to a depth of 18 inches is neutral, reddish brown loam grading to clay loam in the lower 5 inches. To a depth of 56 inches it is brownish clay that has mottles in shades of yellow and is neutral in the upper part and mildly alkaline in the lower part. The subsoil to a depth of 70 inches is moderately alkaline, reddish yellow clay loam that has mottles in shades of red and brown.

This soil is well drained. Permeability is moderately slow, and the available water capacity is high. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate where the surface is bare. The root zone is deep, but the clayey lower layers impede plant root penetration. This soil is easily worked within a moderate range of moisture content.

Included in mapping are soils similar to the Anocon soil; some have a clay loam surface layer, some have calcium carbonate concretions within a depth of 28 inches, and others have sola less than 60 inches thick. Also included are small areas of deeply gullied Anocon soils that have lost part of their surface layer as a result of erosion. A few small outcrops of Vernon soils are in steeper areas. The included soils make up to 30 percent of the map unit.

This Anocon soil is used mainly as rangeland. The native vegetation is a mid and tall grass prairie. Mesquite has invaded some abused areas (fig. 8).

This soil has good potential for use as habitat for wildlife. Deer, dove, quail, and turkey inhabit areas of this soil. Several forbs and grasses provide quality seed for game birds and animals. A good selection of forbs for deer forage is available, but there is little cover for rest and escape.

This soil is moderately suited to cultivation. It is better suited to crops grown during the cool season than to crops grown during the warm season because of the droughty nature of the clayey subsoil. Terracing and farming on the contour help to control erosion. Crop residue left on or near the surface helps conserve moisture, control wind erosion, and maintain tilth and productivity.

This soil is well suited to improved pasture, mainly improved bermudagrass, kleingrass, indiangrass, weeping lovegrass, vetch, and singletary peas. Pasture management objectives include fertilization, weed control, and controlled grazing.

This soil is only moderately suited to most urban and recreational uses because of shrinking and swelling of the subsoil resulting from changes in moisture content. The clayey subsoil restricts percolation of affluent from septic tank systems. This limitation can be overcome by increasing the size of the absorption area. In some areas, steepness of slope restricts the use of this soil for playgrounds.

This Anocon soil is in capability subclass IIIe and in the Loamy Prairie range site.

Ar—Arents, loamy. Arents are gently undulating, loamy soils on uplands. Arents are the soil material that remains after sand and gravel mining operations are suspended. These soils are mainly on terraces along major streams. Generally, after smoothing and leveling, the soils are 1 foot to 3 feet lower than the surrounding landscape. However, mining operations are continuing, and some areas are not reclaimed. The mapped areas are irregularly shaped and range from 5 to 40 acres. Slope ranges from 1 to about 5 percent.

Arents are extremely variable in soil material within any area. They are stratified in shades of red, brown, and yellow. The texture is mainly loamy material that has varying amounts of sand, silt, clay, and gravel. Sandy clay loam is the dominant texture, but fine sand, loamy fine sand, and fine sandy loam are common. All textures

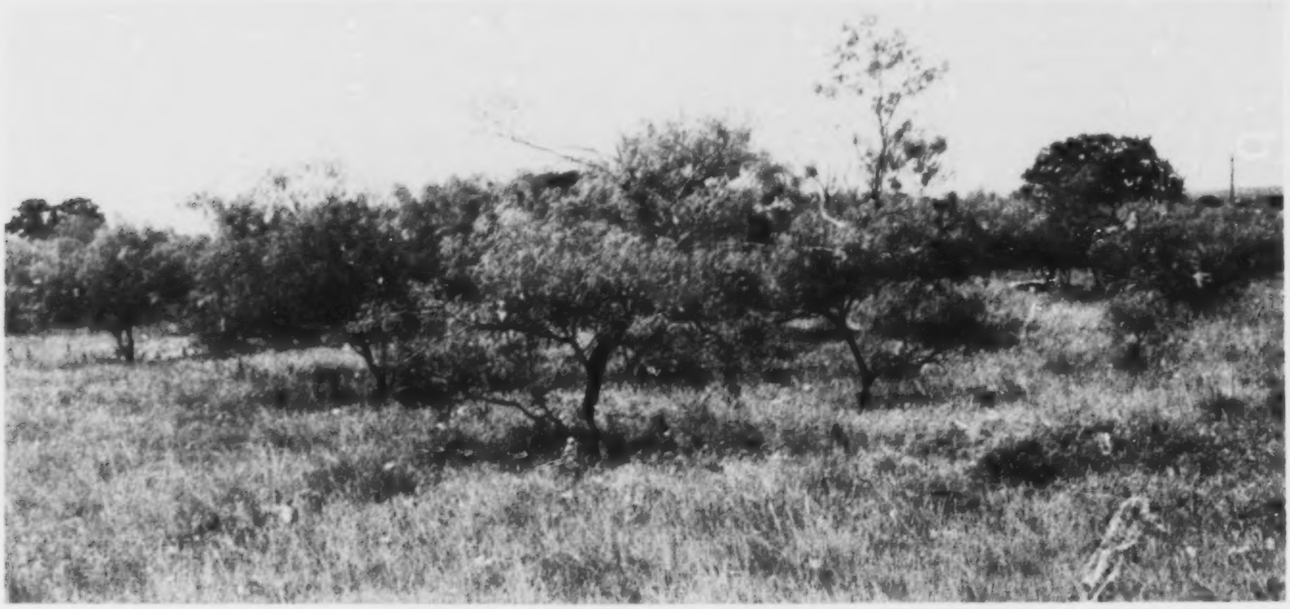


Figure 8.—An area of Anocon loam, 2 to 5 percent slopes, that has been invaded by mesquite trees.

may occur within some areas. Reaction is mainly calcareous and moderately alkaline, but a few strata are neutral or mildly alkaline.

The root zone is deep. These soils are moderately productive if fertilizer is added to offset the loss in organic matter. Since these soils are lower than surrounding soils, some small areas pond water for short periods.

These soils are used mainly as pasture or rangeland. In a few areas, they are used as cropland. A few areas have not been smoothed and reclaimed.

These soils are well suited to pasture. Reclaimed areas are well suited to improved bermudagrass, weeping lovegrass, kleingrass, switchgrass, vetch, and singletary peas.

Reclaimed areas of these soils are moderately suited to use as cropland. Low natural fertility, wet depressional areas, and the hazard of soil blowing are limitations. Crop residue left near the surface helps control erosion and improves soil tilth.

These soils are suited to use as rangeland if they are reclaimed, smoothed, and seeded. Native tall and mid grasses, kleingrass, legumes, Maximilian sunflower, and Illinois bundleflower are suitable rangeland plants.

After these soils are reseeded, they have fair potential for use as habitat for dove, quail, and songbirds. Tall grasses provide nesting areas for turkeys.

These soils are well suited to urban and recreational uses. Controlling runoff and shaping the mined areas are concerns.

Smoothed and reclaimed areas of these soils are in capability subclass IVe and in the Sandy Loam range site.

Ba—Balsora silt loam, occasionally flooded. This soil is deep and nearly level. It is on flood plains of larger streams that drain from areas of sandy and loamy soils. The mapped areas are elongated and range from 5 to 200 acres. Slope is slightly undulating and is less than 1 percent.

Typically, this soil has a neutral, brown silt loam surface layer 6 inches thick. The layer below that to a depth of 22 inches is mildly alkaline, brown silty clay loam that has thin strata of silt loam. The next layer to a depth of 30 inches is moderately alkaline, brown silty clay loam that has thin strata of silt loam and mottles in shades of brown. The next layer to a depth of 62 inches is mildly alkaline, light yellowish brown and pale brown stratified loam.

This soil is well drained. Permeability is moderate, and the available water capacity is high. Runoff is slow. On the average, this soil is flooded one or more times every 3 to 10 years. Floods are very brief to brief during periods of high percipitation in spring and fall. This soil is productive. The root zone is deep and easily penetrated by plant roots. Crops respond well to fertilizer.

Included with this soil in mapping are small areas of Pulexas soils on slightly higher natural levees near stream channels. A soil that has a dark, thick surface layer but otherwise is similar to the Balsora soil is included in some areas. Some minor areas of Balsora soils that have a fine sandy loam, loam, or silty clay loam surface layer are also included. The included soils make up less than 15 percent of the map unit.

This Balsora soil is used as cropland or pasture. Native and improved pecans are grown in some areas.

This soil is well suited to use as cropland. Grain sorghum, forage sorghum, and small grains are major crops. Alfalfa, arrowleaf clover, and other legumes are also suitable for planting. Crop residue left on the surface helps to conserve moisture and maintain tilth and productivity.

This soil is well suited to pasture, mainly improved bermudagrass, switchgrass, kleingrass, and vetch. Fertilization, weed control, and grazing at planned intervals are management objectives.

This Balsora soil has good potential for use as habitat for wildlife. The area is inhabited by deer, dove, quail, and turkey. This soil produces choice winter forage plants for deer and turkey.

This soil is not suited to urban and recreational uses. Flooding is a major hazard, and adequate protection is difficult to provide.

This Balsora soil is in capability subclass IIw and in the Loamy Bottomland range site.

Bb—Balsora silt loam, frequently flooded. This soil is deep and nearly level. It is on stratified flood plains of streams that drain from areas of sandy and loamy soils. Recent shallow scour channels are throughout the map unit. The mapped areas are elongated and range from 20 to about 300 acres. Slope is slightly undulating and less than 1 percent.

Typically, this soil has a neutral, yellowish brown silt loam surface layer about 6 inches thick. The layer below that to a depth of 33 inches is mildly alkaline, stratified brown and light yellowish brown silt loam. The next layer to a depth of 52 inches is mildly alkaline, dark brown silty clay loam that has common strata of light yellowish brown loam and silt loam. The layer below that to a depth of 64 inches is mildly alkaline, dark grayish brown silty clay.

This soil is well drained. Runoff is slow. Permeability is moderate, and the available water capacity is high. On the average, this soil is subject to flooding one or more times every 2 years. Floods are brief and occur during periods of high percipitation in spring and fall. This soil is productive. The root zone is deep and easily penetrated by plant roots.

Included with this soil in mapping are small spots of Deleon and Pulexas soils. Deleon soils are in lower depressional areas. Pulexas soils are on higher ridges or overwashes along the edge of the flood plain or near stream channels. Also included are ponded areas, as large as 4 acres in size, that commonly have a silty clay loam or silty clay surface layer and gray mottles near the surface. The included soils make up less than 20 percent of the map unit.

This Balsora soil is used mainly as pasture. It is well suited to switchgrass, improved bermudagrass, and most commonly grown legumes.

This soil is poorly suited to use as cropland because of flooding; however, alfalfa and forage sorghum are grown in some areas. This soil is well suited to pecans, but flooding in the fall occasionally damages or destroys the nut crop. Areas of this soil that can be protected from flooding have high suitability for use as cropland.

This soil has good potential for use as habitat for wildlife. Deer, turkey, dove, quail, and squirrel inhabit the area. Turkeys commonly roost in the large trees. High-quality forage for deer and turkey is produced. Excellent resting and nesting places and escape cover are also provided. Wet depressional areas are used by waterfowl, egrets, and other birds.

This soil is not suited to urban and recreational uses. Flooding is a major hazard, and adequate protection is difficult to provide.

This Balsora soil is in capability subclass Vw and in the Loamy Bottomland range site.

Bc—Balsora silty clay, frequently flooded. This soil is deep and nearly level. It is on flood plains of large streams. Shallow, meandering depressions are throughout the map unit. Because floodwaters are slow moving, silt and clay particles have settled. The silty clay overwash surface layer is commonly 6 to 16 inches thick. The mapped areas are longer than they are wide and range from 10 to more than 200 acres. Slope is weakly undulating and less than 1 percent.

Typically, this soil has a neutral, brown silty clay surface layer about 9 inches thick. The underlying material to a depth of 44 inches is stratified layers less than 2 inches thick of neutral, dark grayish brown silty clay loam and brown loam that has many prominent bedding planes. A buried horizon of mildly alkaline, dark grayish brown silty clay loam extends to a depth of at least 60 inches.

This soil is well drained. Permeability is moderate, and the available water capacity is high. Runoff is slow. This soil is subject to flooding 5 or more times every 10 years. Floods during fall and spring range from a few inches deep for short periods to several feet deep for as much as a 10 day duration. Water may remain in depressions for several days after the floodwater has returned to stream channels. The root zone is deep, and plants rarely suffer drought stress.

Included in mapping are small areas of soils similar to the Balsora soil; some have a clayey surface layer as much as 30 inches thick, and others have less than 18 percent clay in the control section. The included soils make up less than 20 percent of the map unit.

This Balsora soil is used as pasture, rangeland, or cropland. Native pecan trees are common.

This soil is well suited to pasture and rangeland. Improved bermudagrass is the most common pasture plant, but switchgrass is also grown. Most rangeland areas have a thick overstory of hackberry, ash, elm, and pecan.

Much of this soil is used as cropland because of its high natural fertility and available water capacity. Most successful cropping is during the summer months after the danger of spring flooding. The clayey surface layer compacts if it is cultivated when the soil is wet. The compacted layer restricts penetration of air, water, and roots.

This soil has good potential for use as habitat for deer, turkey, and game birds. It has wooded areas adjoining grain fields, and small, wet, depressional areas provide food and resting places for waterfowl.

This clayey soil is not suited to urban and recreational uses because of flooding.

This Balsora soil is in capability subclass Vw and in the Loamy Bottomland range site.

BdB—Bastsil loamy fine sand, 0 to 3 percent slopes. This soil is deep. It is on nearly level and gently sloping terraces above flood plains of major streams. The mapped areas are subrounded and range from 10 to about 55 acres.

Typically, this soil has a slightly acid loamy fine sand surface layer about 17 inches thick. This layer is brown in the upper part and yellowish red in the lower part. The subsoil to a depth of 65 inches is yellowish red sandy clay loam that is neutral to a depth of 27 inches and slightly acid below that depth.

This soil is well drained. Permeability is moderate, and the available water capacity is moderate. Runoff is slow, and the hazard of water erosion is slight. The hazard of wind erosion in unprotected areas is severe. This soil has good response to fertilizer. It is easily worked throughout a wide range of moisture content. The root zone is deep and easily penetrated by plant roots. In a few areas, this soil is stripmined for sand and gravel.

Included with this soil in mapping are a few small, circular, depressional spots of Hassee soils and an occasional ridge of closely similar Heaton soils. A few small areas of Bastsil sandy clay loam are also included. These areas are the result of severe soil blowing that has exposed the subsoil. The included soils make up less than 10 percent of the map unit.

This Bastsil soil is used mainly for improved pasture.

This soil is well suited to use as cropland. Small grains, grain sorghum, peanuts, melons, vineyards, and fruits and nuts are suitable crops (fig. 9). Cool-season legumes can be grown. Crop residue left on the surface helps maintain fertility and control soil blowing. Crops, such as grain sorghum, melons, and peanuts, can be planted in strips to help control soil blowing.

This soil is well suited to pasture, mainly improved bermudagrass, weeping lovegrass, switchgrass, indiangrass, vetch, and arrowleaf clover. Fertilization at planned intervals, weed control, and controlled grazing are pasture management objectives. Grass planted in old crop residue provides protection from blowing sand. The residue also helps maintain soil moisture.

This soil has good potential for use as habitat for wildlife. Wooded areas are inhabited by deer, turkey, squirrel, quail, and dove. Other small animals and birds feed, rest, and raise their young on this site. If brush is dense, habitat for most wildlife declines, although deer use the brush for escape and resting cover.

This soil is well suited to most urban and recreational uses. The sandy surface layer limits some recreational uses if good grass cover cannot be maintained.

This Bastsil soil is in capability subclass IIIe and in the Loamy Sand range site.

BsB—Bastsil fine sandy loam, 0 to 3 percent slopes. This soil is deep. It is on nearly level and gently sloping terraces above flood plains of major streams. The mapped areas are subrounded to elongated and range from 5 to 80 acres or more.

Typically, this soil has a slightly acid, light brown and brown fine sandy loam surface layer about 15 inches thick. The subsoil to a depth of 80 inches is slightly acid sandy clay loam. It is yellowish red in the upper part and red in the lower part.

This soil is well drained. Permeability is moderate, and the available water capacity is moderate. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil responds well to fertilizer. It is easily worked throughout a wide range of moisture content. The root zone is deep and easily penetrated by roots. Some areas of this soil are stripmined for sand and gravel.

Included with this soil in mapping are small areas of Hassee and Silawa soils. Hassee soils are in depressions. Silawa soils are in higher, more sloping positions than those of the Bastsil soil. The included soils make up 5 to 10 percent of the map unit.

This Bastsil soil is used mainly for oats, wheat, peanuts, and improved bermudagrass. It is well suited to these uses. Sorghums, orchards, vineyards, and truck crops are grown in some areas (fig. 10). The major management objectives are to prevent soil blowing and to maintain tilth and fertility. This can be achieved by growing cool-season legumes and leaving crop residue on or near the surface.

This soil is well suited to pasture, mainly improved bermudagrass, weeping lovegrass, kleingrass, switchgrass, arrowleaf clover, and vetch. Management

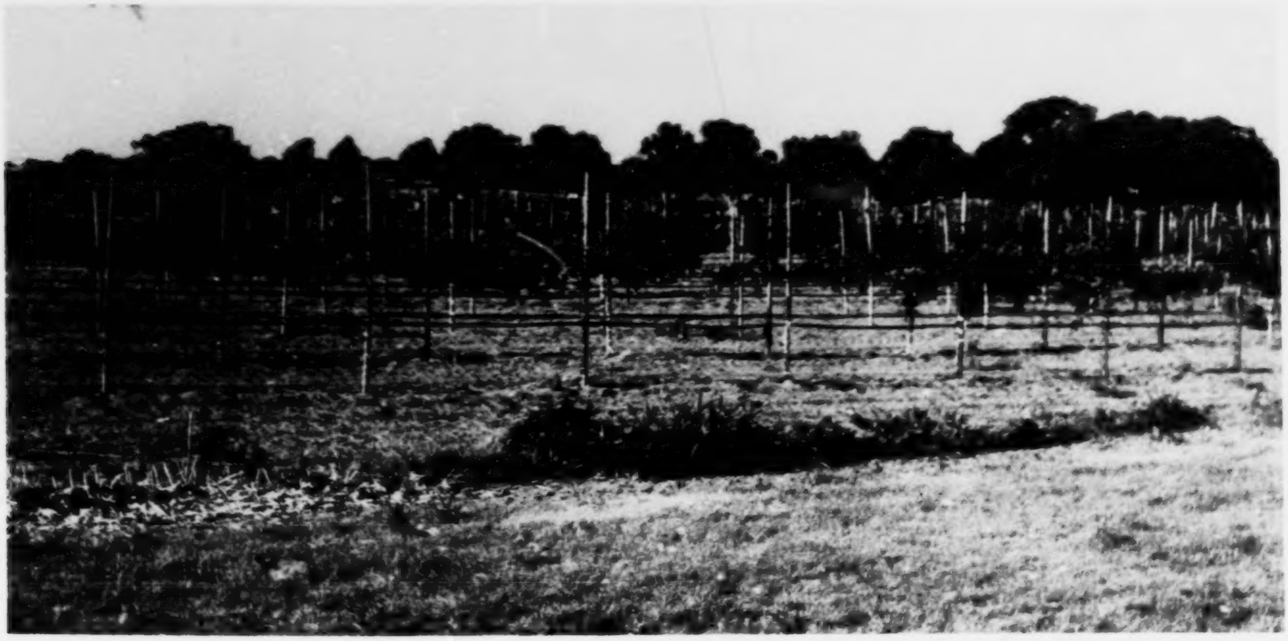


Figure 9.—Bastsil loamy fine sand, 0 to 3 percent slopes, is well suited to grapes.

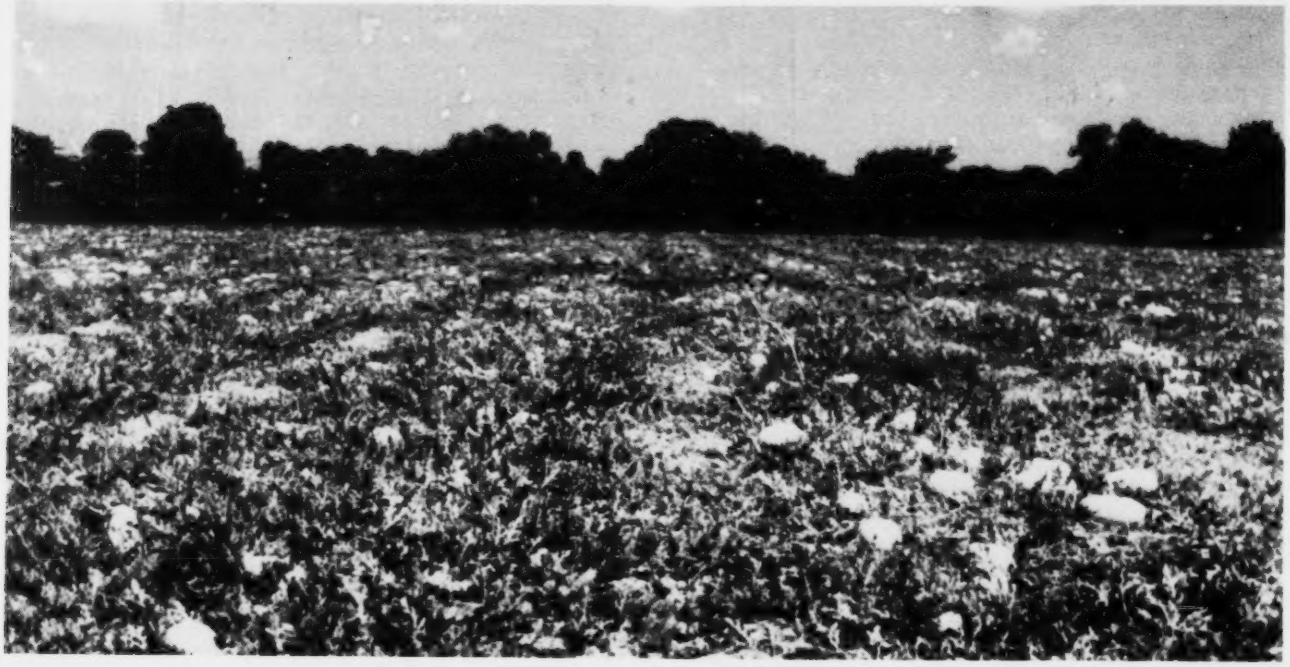


Figure 10.—Bastsil fine sandy loam, 0 to 3 percent slopes, is well suited to watermelons. The watermelons are planted in strips to help control soil blowing.

objectives include weed control, nitrogen and phosphorus fertilization, and controlled grazing.

This soil has good potential for use as habitat for wildlife. Deer, dove, quail, squirrel, and turkey inhabit the area. Several of the woody plants, forbs, and grasses provide good cover, browse, mast, and seeds for game birds and animals. Small grains provide additional winter grazing for deer and turkey as well as seed for dove and quail.

This soil is well suited to most urban and recreational uses.

This Bastsil soil is in capability subclass IIe and in the Sandy Loam range site.

BkB—Blanket clay loam, 1 to 3 percent slopes. This soil is deep and gently sloping. It is in colluvial valleys above narrow flood plains. Small but deep drainageways run through most areas. The mapped areas are irregularly shaped to elongated and range from 10 to 35 acres. Slope is concave and averages less than 2 percent.

Typically, this soil has a mildly alkaline, very dark grayish brown clay loam surface layer about 18 inches thick. The subsoil is mildly alkaline, dark grayish brown clay in the upper part and mildly alkaline, dark grayish brown and dark brown clay loam in the middle part. The lower part to a depth of 80 inches or more is moderately alkaline, brown and pale brown clay loam that has a high concentration of calcium carbonate in the form of threads, soft masses, and concretions.

This soil is well drained. Permeability is moderately slow, and the available water capacity is high. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. This soil receives extra moisture as runoff from higher, adjacent soils. It is easy to work, but the moisture content range is limited. The root zone is deep, but root penetration is slow in the underlying clayey layers.

Included with this soil in mapping are small areas of Frio soils along narrow streams and Venus soils along upper slopes. Also included are a few areas of soils that have calcium carbonate within 28 inches of the soil surface but otherwise are similar to the Blanket soil. The included soils make up to 15 percent of the map unit.

This Blanket soil is used mainly as pasture or rangeland. It is well suited to improved bermudagrass, kleingrass, switchgrass, arrowleaf clover, vetch, and singletary peas. Fertilizer, weed control, and controlled grazing are needed for high production.

This soil is well suited to crops. Small grains, forage sorghums, and grain sorghums are commonly grown (fig. 11). Erosion can be controlled and tilth can be maintained by terracing, farming on the contour, and returning crop residue to the soil. Crop residue left on the surface helps conserve moisture and lower soil temperature.

This soil has fair potential for use as habitat for wildlife. Quail and dove inhabit the area. Several of the native forbs and grasses provide seed for game birds and animals. Cultivated crops provide additional forage. Turkey and deer forage through some areas, but plant cover for escape and resting is scarse.

This soil is moderately suited to most urban uses. The most restrictive limitations are shrinking and swelling and corrosivity to uncoated steel. The moderately slow permeability is a limitation for septic tank absorption fields.

This soil is moderately suited to most recreational uses. The main limitations are permeability and the clay loam surface layer that is sticky when wet.

This Blanket soil is in capability subclass IIe and in the Clay Loam range site.

BoB—Bolar clay loam, 1 to 3 percent slopes. This soil is moderately deep and gently sloping. It is on convex upland ridges and side slopes. The mapped areas are elongated and range from 6 to about 45 acres.

Typically, this soil has a moderately alkaline, dark grayish brown clay loam surface layer about 12 inches thick. The subsoil to a depth of 32 inches is moderately alkaline loam that has a high concentration of calcium carbonate. It is light olive brown in the upper part and light yellowish brown in the lower part. The underlying material to a depth of 47 inches is fractured limestone interbedded with marly clay.

This soil is well drained. Permeability is moderate, and the available water capacity is low. Surface runoff is medium, and the hazard of erosion is moderate. Some plants are subject to iron chlorosis because the lime content is high. The root zone is moderately deep and is easily penetrated by plant roots. Roots are also in fractures between the limestone layers.

Included with this soil in mapping are small areas of Aledo, Purves, and Somervell soils on slight ridges. The included soils make up 5 to 20 percent of the map unit.

A large acreage of this Bolar soil is used as rangeland, and a large acreage is used for wheat and oats for both grazing and grain. Forage and grain sorghums are also grown.

This soil is well suited to use as cropland, but the low available water capacity limits production. This soil is best suited to crops grown during the cool season. Close-spaced crops, such as small grains, and residue left on the surface help slow runoff and improve soil tilth. The residue also helps to conserve soil moisture and lower soil temperature.

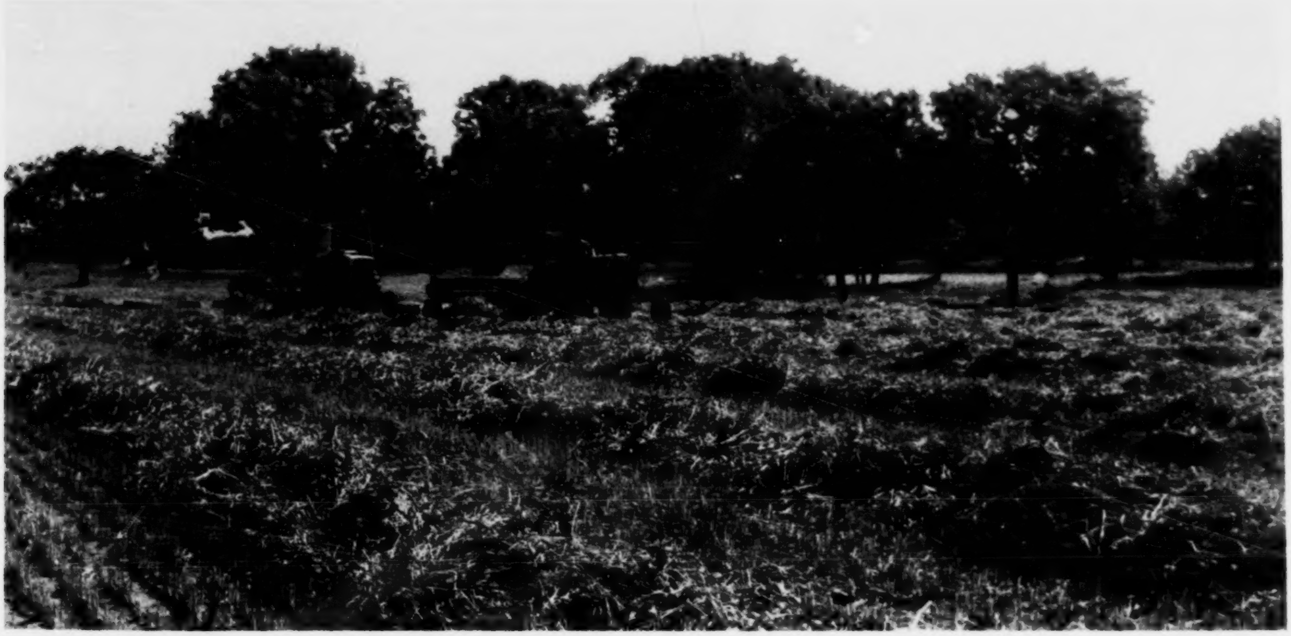


Figure 11.—Forage sorghum is baled for hay on Blanket clay loam, 1 to 3 percent slopes. The pecan trees in the background are on Frio silty clay loam, occasionally flooded.

This soil is well suited to pasture; however, the high lime content of the subsoil and depth to bedrock limit production. Improved bermudagrass, kleingrass, switchgrass, vetch, and singletary peas are suitable pasture plants. Fertilizer is needed to maintain or increase production.

This soil has fair potential for use as habitat for wildlife. Dove, quail, and songbirds inhabit the area. Several of the forbs and grasses provide seed and cover for birds. Crops provide additional food. Woody vegetation is not available so large animals seldom use this area.

This soil is only moderately suited to most urban and recreational uses because of shrinking and swelling of the surface layer resulting from changes in moisture content, the corrosivity of uncoated steel, and the depth to bedrock. Septic tank absorption systems work satisfactory if the absorption field is the proper size. Much of the shrinking and swelling can be reduced by replacing the dark surface layer with loamy fill material. During wet periods, loamy fill material and good grass cover can help to overcome the sticky surface layer.

This Bolar soil is in capability subclass IIe and in the Clay Loam range site.

BoC—Bolar clay loam, 3 to 5 percent slopes. This soil is moderately deep and gently sloping. It is on convex ridges. The mapped areas follow the contour and are long and narrow. They range from 8 to about 100 acres.

Typically, this soil has a moderately alkaline, dark grayish brown clay loam surface layer about 12 inches thick. The layer below that to a depth of 28 inches is moderately alkaline, brown clay loam. The next layer to a depth of 34 inches is moderately alkaline, light brown loam that has fragments of limestone and many concretions and soft masses of calcium carbonate. The underlying material to a depth of 60 inches is fractured limestone interbedded with marly clay and chalky limestone.

This soil is well drained. Permeability is moderate, and the available water capacity is low. Runoff is medium, and the hazard of erosion is moderate. Because of the high content of calcium carbonate, some sensitive plants are affected by iron chlorosis. The root zone is moderately deep and is easily penetrated by plant roots.

Included with this soil in mapping are small areas of Aledo, Sanger, and Somervell soils. Aledo soils are underlain by narrow bands of fractured limestone. Sanger soils are near the head of drainageways. Somervell soils are similar to the Bolar soil but are more than 35 percent, by volume, limestone fragments in the B horizon. The included soils make up to 20 percent of the map unit.

This Bolar soil is used mainly as rangeland. The climax plant community is dominantly mid and tall grasses.

This soil has fair potential for use as habitat for wildlife. Woody cover is not available, so this area is used mostly by small game birds and animals. Several of the forbs and grasses provide seed and cover. Coyotes use the tall grasses for rest areas and den in the friable, loamy soil.

This soil is moderately suited to pasture. The high lime content of the subsoil and the low available water capacity limit production. Improved bermudagrass, kleingrass, switchgrass, vetch, and singletary peas are suitable pasture plants. Fertilizer, weed control, and controlled grazing are needed to produce good yields.

This Bolar soil is moderately suited to use as cropland. Low available water capacity and runoff limit production. Terracing and contour farming help to slow runoff and allow more water to enter the soil. Grassed waterways are needed for safe removal of excess terrace water. Close-spaced crops, such as small grains, and residue left on the surface help control erosion and improve soil tilth.

This soil is only moderately suited to most urban uses because of the depth to bedrock, shrinking and swelling resulting from changes in moisture content, and corrosivity to uncoated steel. The rock layer limits the amount of grading and leveling that can be easily done and restricts downward movement of water. Seepage from septic tank systems may occur in steeper areas.

This soil is moderately suited to most recreational uses. Steepness of slope, depth to bedrock, and the clay loam surface layer are the main limitations. Loamy fill material and good grass cover can help overcome the sticky surface.

This Bolar soil is in capability subclass IIIe and in the Clay Loam range site.

BtC—Bonti fine sandy loam, 2 to 5 percent slopes. This soil is moderately deep and gently sloping. It is on upland ridges. The mapped areas are elongated and range from about 6 to 30 acres. Slope is convex and averages about 3 percent.

Typically, this soil has a neutral fine sandy loam surface layer about 8 inches thick. This layer is brown in the upper part and light yellowish brown in the lower part. The subsoil to a depth of 26 inches is medium acid clay. The upper part is reddish brown, and the lower part is yellowish red with dark red and strong brown mottles. It is underlain by reddish, strongly cemented, medium acid sandstone that has clay flows and roots in fractures.

This soil is well drained. Permeability is moderately slow, and the available water capacity is low. Runoff is medium, and the hazards of wind and water erosion are moderate. The sandstone that underlies this soil limits the depth that plant roots can penetrate. Tilth is poor, and a hard crust forms on the surface when the soil is dry.

Included with this soil in mapping are small, intermingled areas of Exray and Truce soils. Exray soils are along the edge of ridgetops, and Truce soils are underlain by shaly clay. Also included are small areas of Bonti soils that have sandstone fragments on the surface. The included soils make up to 20 percent of the map unit.

Rangeland is the predominant use of this Bonti soil, and many areas are managed for wildlife. Various amounts of tall and mid grasses, forbs, and oak trees, depending on past management practices, are on this soil.

This soil has good potential for use as habitat for wildlife. Quail and dove inhabit this area. Deer and turkey feed in this area and use cover on adjacent soils. Disturbing the soil encourages the growth of seed-producing plants.

This Bonti soil is moderately suited to small grains, sorghums, and winter legumes. Terracing and farming on the contour are needed to control water erosion. Strongly cemented sandstone may be reached by excavation or cuts deeper than about 20 inches. Crop residue left on or near the surface slows runoff, prevents soil blowing, lowers soil temperature, and reduces crusting.

This soil is moderately suited to pasture. Improved bermudagrass, weeping lovegrass, kleingrass, and vetch are suitable pasture plants. Pasture management objectives include weed control, fertilization, and planned grazing.

This soil is only moderately suited to urban and recreational uses because of the depth to bedrock and low strength as it affects local roads and streets. Steepness of slope is a limitation for some playground uses.

This Bonti soil is in capability subclass IIIe and in the Sandy Loam range site.

BxC—Bonti-Exray complex, stony, 1 to 8 percent slopes. This complex consists of moderately deep and shallow soils on gently sloping to sloping ridges and side slopes. Fragments of sandstone 3 to 48 inches across and 2 to 18 inches thick are scattered on the surface and imbedded in the surface layer. Most stones are less than 24 inches across and less than 10 inches thick. These stones cover about 3 to 8 percent of the surface. They are nearly absent in some less sloping areas and are more abundant in the more sloping areas. The mapped areas are elongated and range from 8 to 150 acres. Slope is convex and averages about 4 percent.

This complex is about 40 percent Bonti soil, 35 percent Exray soil, and 25 percent other soils. The soils in this complex are too intricately mixed to be mapped separately at the selected scale. Bonti soil is underlain by sandstone bedrock at a depth of 20 to 40 inches and is mainly on lower side slopes. Exray soil is underlain by sandstone at a depth of 10 to 20 inches and is mostly on steeper slopes and narrow ridgetops.

Typically, this Bonti soil has a slightly acid stony fine sandy loam surface layer about 11 inches thick that is brown in the upper part and light yellowish brown in the lower part. The subsoil to a depth of 30 inches is reddish clay that has a few fragments of weathered sandstone. The upper part is medium acid, and the lower part is strongly acid and has a few brownish mottles. The underlying material is strongly cemented, yellow sandstone that is coarsely fractured. Reddish brown clay flows and roots are in the fractures.

This Bonti soil is well drained. Permeability is moderately slow, and the available water capacity is low. Runoff is rapid, and the hazards of water erosion and soil blowing are slight because of the many stones on the surface. The root zone is moderately deep, and the clayey subsoil impedes plant root penetration.

Typically, this Exray soil has a neutral stony fine sandy loam surface layer about 6 inches thick that is dark brown in the upper part and light yellowish brown in the lower part. The subsoil to a depth of 16 inches is medium acid, yellowish red clay that has a few fragments of sandstone. The underlying material to a depth of 40 inches is pinkish white fractured sandstone. Reddish clayey material and roots are in fractures.

This Exray soil is well drained. Permeability is moderately slow, and the available water capacity is very low. Runoff is rapid, and the hazards of water erosion and soil blowing are slight. Although the soil is shallow, roots receive extra moisture by entering crevices in the fractured sandstone below.

Included with these soils in mapping are small areas of Darnell soils, which make up to 25 percent of the complex. Some mapped areas have small areas of Cona and Truce soils that are underlain by thin strata of clayey shale. These closely similar soils make up to 20 percent of the complex.

The soils in this complex are used mainly as rangeland and wildlife habitat. Most of the areas have a dense overstory of oaks, vines, and brush.

These soils have fair potential for use as habitat for wildlife. Quail, dove, deer, and turkey inhabit the area. Adequate cover is available for resting and escape. The absence of quality winter plants for deer is a limitation. Brush maintained in strips or patterns increases the food supply.

These soils are poorly suited to pasture, crops, and recreational uses. Droughtiness because of depth to sandstone, large stones, and low natural fertility are major limitations.

These soils are only moderately suited to urban uses. Depth to bedrock and the moderately slow permeability are severe limitations for septic tank absorption fields. Large stones, depth to bedrock, and steepness of slope limit the amount of grading and leveling that can be easily done.

The soils in this complex are in capability subclass VIs and in the Sandy Loam range site.

ByE—Brackett-Aledo complex, 5 to 20 percent slopes. This complex consists of deep to very shallow soils on sloping to moderately steep uplands above drainageways. These soils are mostly on hillsides below a ridgetop. These hillsides have limestone strata that outcrop at various elevations. The rock outcrops form long, narrow, steep ledges and give the area a benched or terraced appearance. Bands of marine shell fragments and limestone rock- and gravel-size fragments cover 3 to 25 percent of the soil surface. Most of the soils in this complex have a gravelly surface layer. The mapped areas are subrounded to long and narrow and range from 8 to about 400 acres.

This complex is about 40 percent Brackett soil, 25 percent Aledo soil, and 35 percent closely similar soils and rock outcrop. The soils in this complex are too intricately mixed to be mapped separately at the selected scale. Brackett soil is between bands of rock outcrop and is underlain by limy marl interbedded with thin bands of fractured limestone. Aledo soil is underlain by fractured limestone mainly on or near ledges.

Typically, this Brackett soil has a moderately alkaline, light yellowish brown gravelly loam surface layer about 6 inches thick. The next layer to a depth of 18 inches is moderately alkaline, pale yellow loam. The underlying material to a depth of 40 inches is moderately alkaline, light gray and pale yellow limy earth and mottled light gray, pale yellow, and yellowish brown silty marl interbedded with thin layers of fractured limestone.

This Brackett soil is well drained. Permeability is moderate, and the available water capacity is low. Runoff is rapid, and the hazard of erosion is severe. The root zone is shallow to deep, and plant roots can easily penetrate the soil. The roots obtain extra moisture by penetrating the underlying parent material.

Typically, this Aledo soil has a moderately alkaline, dark brown gravelly loam surface layer about 6 inches thick. The next layer to a depth of 13 inches is moderately alkaline, dark brown very gravelly loam. The underlying material to a depth of 20 inches is hard limestone rock that is coarsely fractured and interbedded with clayey marl.

This Aledo soil is well drained. Permeability is moderate, and the available water capacity is very low. Runoff is rapid, and the hazard of erosion is severe. During wet seasons, water seeps to the surface along some rock outcrops. The root zone is very shallow to shallow and easily penetrated by plant roots. Plant roots enter the fractures between the limestone.

Included with these soils in mapping are small areas of Aledo and Brackett soils that have slope of more than 20 percent; areas of closely similar Bolar and Somervell soils; areas of soils that are less than 10 inches deep to hard, sparsely fractured limestone; areas of soils that are similar to the Brackett soil but have more coarse fragments or they are underlain by indurated limestone; and areas of limestone outcrop. The included soils and rock outcrop make up 10 to 35 percent of the map unit.

Because of the shallow rooting depth, steep slopes, and rock outcrops, this complex is used as rangeland. The area is a prairie that commonly has brush and trees along drainageways.

These soils have fair potential for use as habitat for wildlife. Dove and quail inhabit areas of these soils. Several of the forbs and grasses provide seed for game birds and animals. A good selection of forbs is available for deer forage, but little cover is provided for escape and resting. Excessive grazing reduces food and cover for wildlife.

These soils are not suited to crops, pasture, or most urban and recreational uses. Shallow depth to hard limestone, steepness of slope, and soil slippage are the main limitations. Recreational use is mainly limited to picnic areas and path and trails.

This complex is in capability subclass VIIs. Brackett soil is in the Steep Adobe range site, and Aledo soil is in the Shallow range site.

ChB—Chaney loamy fine sand, 1 to 4 percent slopes. This soil is deep and gently sloping. It is on upland stream divides and their side slopes. The areas are irregularly shaped to oblong and range from 6 to 120 acres. Where this soil has been cultivated, wind erosion has caused mounded areas along some fence rows.

Typically, this soil has a slightly acid loamy fine sand surface layer about 12 inches thick. This layer is brown in the upper part and pale brown in the lower part. The subsoil to a depth of 24 inches is slightly acid, yellowish brown sandy clay that has reddish yellow and grayish brown mottles. To a depth of 40 inches, it is neutral, brownish yellow sandy clay that has red, yellowish red, and light gray mottles. The lower part of the subsoil to a depth of 46 inches is mildly alkaline, brownish yellow sandy clay loam that has red and light gray mottles and a few concretions of calcium carbonate. The underlying material to a depth of 72 inches is moderately alkaline, light gray sandy clay loam interbedded with shaly and clayey material. It has red and brownish yellow mottles and concretions of calcium carbonate.

This soil is moderately well drained. Permeability is slow, and the available water capacity is moderate. Runoff is slow, and water is temporarily perched above the clayey subsoil during periods of high precipitation. The hazard of water erosion is slight, but soil blowing is severe in unprotected areas of this soil. The root zone is deep; however, the clayey subsoil impedes root penetration.

Included with this soil in mapping are areas of stony and gullied Chaney soils. These areas are mostly less than 4 acres. Also included are Cisco and Windthorst soils in small areas on ridges and Hassee and Selden soils in slight depressions. The included soils are less than 5 acres and together make up less than 20 percent of the map unit.

This Chaney soil is used mostly as rangeland or pasture.

This soil is well suited to peanuts, sorghums, pecan orchards, vineyards, and truck crops. Crop residue left on the soil surface helps conserve moisture, slows runoff, reduces soil blowing, and maintains productivity. Tall and short crops, alternated in strips, and cover crops help control soil blowing.

This soil is well suited to pasture, mainly improved bermudagrass, weeping lovegrass, switchgrass, arrowleaf clover, and vetch. Fertilizer, weed control, and controlled grazing are needed for maximum production.

This soil is extensively used as rangeland. Many old cropland fields are now in mid and tall native grasses. Small, native wooded areas have degenerated to thick stands of trees and brush.

This soil has good potential for use as habitat for wildlife. Deer, turkey, squirrel, dove, and quail inhabit the area. They feed extensively on acorns, other mast, crop residue, and winter cover crops. Other small animals and birds feed, nest, and raise their young on this site. If brush is dense, habitat for most wildlife declines, although deer use the brush for escape and resting cover.

This soil is only moderately suited to most urban uses because of the shrink-swell potential and low strength that affects roads and streets. These limitations can be partly overcome with proper design and installation of urban structures. The clayey lower layers take water slowly, which is a limitation for septic tank absorption fields. This limitation can be overcome by increasing the size of the absorption field.

This soil is well suited to recreational uses; however, the loose, sandy surface layer is a limitation. Loamy fill material and good grass cover can help overcome this limitation.

This Chaney soil is in capability subclass IIIe and in the Loamy Sand range site.

CoB—Cisco loamy sand, 1 to 3 percent slopes. This soil is deep and gently sloping. It is on uplands. The mapped areas are oblong and range from 5 to about 40 acres.

Typically, this soil has a neutral, light yellowish brown and light brown loamy sand surface layer about 13 inches thick. The subsoil to a depth of 40 inches is yellowish red sandy clay loam that is neutral in the upper part and slightly acid in the lower part. To a depth of 48 inches, it is slightly acid, reddish yellow fine sandy loam. The underlying material to a depth of 60 inches is mildly alkaline, very pale brown loamy sand that is massive.

This soil is well drained. Permeability is moderate, and the available water capacity is moderate. The hazard of soil blowing is severe if the soil is bare of vegetation. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are small areas of Chaney and Selden soils and a few small spots of soils along fence rows that have a wind-deposited surface layer that is thicker than the depth allowed for Cisco soil. The included soils make up 5 to 15 percent of the map unit.

This Cisco soil is used mainly as pasture or hayland. It is well suited to improved bermudagrass, indiangrass, switchgrass, and weeping lovegrass. Grass seedlings are difficult to establish because of blowing sands and the difficulty of obtaining a firm seedbed. Fertilizer and weed control are needed for sustained forage production.

This soil is only moderately suited to use as cropland because of the loose, sandy surface. This soil is suited to peanuts, vetch, sorghum, grapes, melons, other truck crops, and orchards. Leaving crop residue on the surface helps to maintain the organic matter content and control soil blowing.

This soil has good potential for use as habitat for wildlife. Areas of this soil are inhabited by songbirds, upland game birds, small mammals, and deer. Crop residue and winter cover crops provide forage for deer and game birds. Most areas are cleared of woody vegetation leaving only sparse cover available for protection and rest.

This soil is well suited to most urban and recreational uses. The main limitation is the loamy sand surface that blows when the soil is bare of vegetation.

This Cisco soil is in capability subclass IIIe and in the Loamy Sand range site.

CsE—Cona very stony sandy loam, 3 to 12 percent slopes. This soil is deep. It is on gently sloping to strongly sloping hillsides and narrow stream divides. Sandstone or sandstone conglomerate fragments cover about 5 to 20 percent of the surface. In some areas, a narrow band of boulders as much as 6 feet across outcrop on the edge of ridgetops. Others outcrop at mid slope. These boulders cover 20 to 40 percent of the surface. Rounded siliceous pebbles mainly less than 1 inch in diameter average about 20 percent of the volume of the surface layer. They are more abundant near the large boulders and less abundant or absent near the smaller conglomerate fragments. The mapped areas are elongated to subrounded and range from 15 to several hundred acres.

Typically, this soil has a very stony sandy loam surface layer about 9 inches thick. It is neutral and brown in the upper part and slightly acid and pale brown in the lower part. Sandstone conglomerate fragments, mainly 3 to 30 inches thick and 6 to 60 inches across their long axis, are imbedded in the surface layer and cover about 15 percent of the surface. The subsoil to a depth of 22 inches is strongly acid, red clay. To a depth of 32 inches it is medium acid, reddish yellow clay that has red mottles. The subsoil to a depth of 39 inches is neutral, brownish yellow clay. The underlying material to a depth of 60 inches is mildly alkaline, brownish yellow and reddish brown shaly clay that has a few light gray mottles.

This soil is well drained. Permeability is slow, and the available water capacity is moderate. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is slight because of the large stones. The root zone is moderately deep, but the dense clayey subsoil restricts some root penetration.

Included with this soil in mapping are small areas of Darnell, Exray, Owens, Truce, and Windthorst soils. Darnell and Exray soils are on outcrops of thin strata of sandstone. Owens soils are on small rounded spots underlain by outcroppings of calcareous, shaly clay. The closely similar Truce and Windthorst soils are on less sloping foot slopes than the Cona soil. A loamy soil that is underlain by sandstone at a shallow depth is on ridgetops or the edge of a cuesta and makes up less than 10 percent of some mapped areas. A shallow, reddish loamy soil that is mildly alkaline or moderately alkaline outcrops as rounded or elongated prairie areas and makes up to 10 percent of some mapped areas. Also included are narrow bands of Cona soils that have slope of up to 30 percent. The included soils make up 15 to 35 percent of the map unit.

This Cona soil is used as rangeland.

This soil is not suited to pasture or cultivation. The bouldery surface, steepness of slope, and susceptibility to water erosion are the main limitations.

This soil has fair potential for use as habitat for wildlife. It provides good cover for deer, quail, dove, and turkey. The absence of quality winter plants for deer is a limitation. Overgrazing causes a decline in quality plants. Brush thickens, thus decreasing the food supply.

Steepness of slope, shrinking and swelling with changes in moisture content, and large stones on the surface restrict the use of this soil for urban and recreational development. In places, however, esthetic values more than offset the limitations, and dwellings are being built.

This Cona soil is in capability subclass VIs and in the Sandstone Hill range site.

DaE—Darnell-Exray complex, very stony, 5 to 20 percent slopes. This complex consists of shallow soils on sloping to moderately steep side slopes above drainageways. Post oak and blackjack oak dominate most areas. Shrubs and mid and tall grasses laced with greenbrier are in small openings between trees. Fragments of strongly cemented sandstone 3 to 60 inches or more across and 3 to 30 inches thick cover 3 to 15 percent of the surface (fig. 12). Narrow ridgetops are in some areas. Some areas have steep, narrow bands that have outcrops of fractured sandstone bedrock and many large boulders. The mapped areas are irregularly shaped to elongated and range from 10 to several hundred acres. Slope is convex and averages about 12 percent.

This complex is about 55 percent Darnell soil, 20 percent Exray soil, and 25 percent other soils and rock outcrop. The soils in this complex are too intricately mixed to be mapped separately at the selected scale. Darnell soil does not have a clayey subsoil, and Exray soil has a reddish clayey subsoil. Both soils are scattered throughout the area, but Darnell soil is dominant in the steeper parts and along the edge of slope breaks.

Typically, this Darnell soil has a slightly acid, brown very stony fine sandy loam surface layer about 3 inches thick. The subsoil to a depth of 11 inches is slightly acid, light brown fine sandy loam that has fragments of partly weathered sandstone in the lower part. The underlying material to a depth of 14 inches is slightly acid, light brown, moderately cemented sandstone.

This Darnell soil is well drained. Permeability is moderately rapid, and the available water capacity is very low. Runoff is rapid, and the hazard of water erosion is severe where the soil is unprotected. The root zone is shallow and is easily penetrated by plant roots. Plant roots receive extra moisture by penetrating fractures in the underlying bedrock.

Typically, this Exray soil has a neutral, very stony fine sandy loam surface layer about 7 inches thick. The surface layer is brown in the upper part and light brown in the lower part. The subsoil to a depth of 16 inches is medium acid, red clay that has a few weathered fragments of sandstone in the lower part. The underlying material is medium acid, yellowish sandstone that is fractured in the upper few inches.

This Exray soil is well drained. Permeability is moderately slow, and the available water capacity is very low. Runoff is rapid, and the hazards of water erosion and soil blowing are severe in unprotected areas. The root zone is shallow, but the clayey subsoil restricts penetration by plant roots. The fractured bedrock allows increased rooting depth.

Included in mapping are small areas and bands of Bonti and Cona soils and rock outcrop. Narrow bands of bouldery sandstone and Pulexas soils on narrow flood plains are in some areas.

The soils in this complex are used as rangeland and habitat for wildlife. In some areas, livestock accessibility is restricted by steep slopes and large boulders.

These soils have fair potential for use as habitat for wildlife. They provide good cover for deer, quail, dove, and turkey. Continuous overgrazing has caused oaks and elms to increase and grasses and forbs to decrease. The absence of quality winter plants for deer is a limitation. Brush, maintained in strips, increases food supply for wildlife.

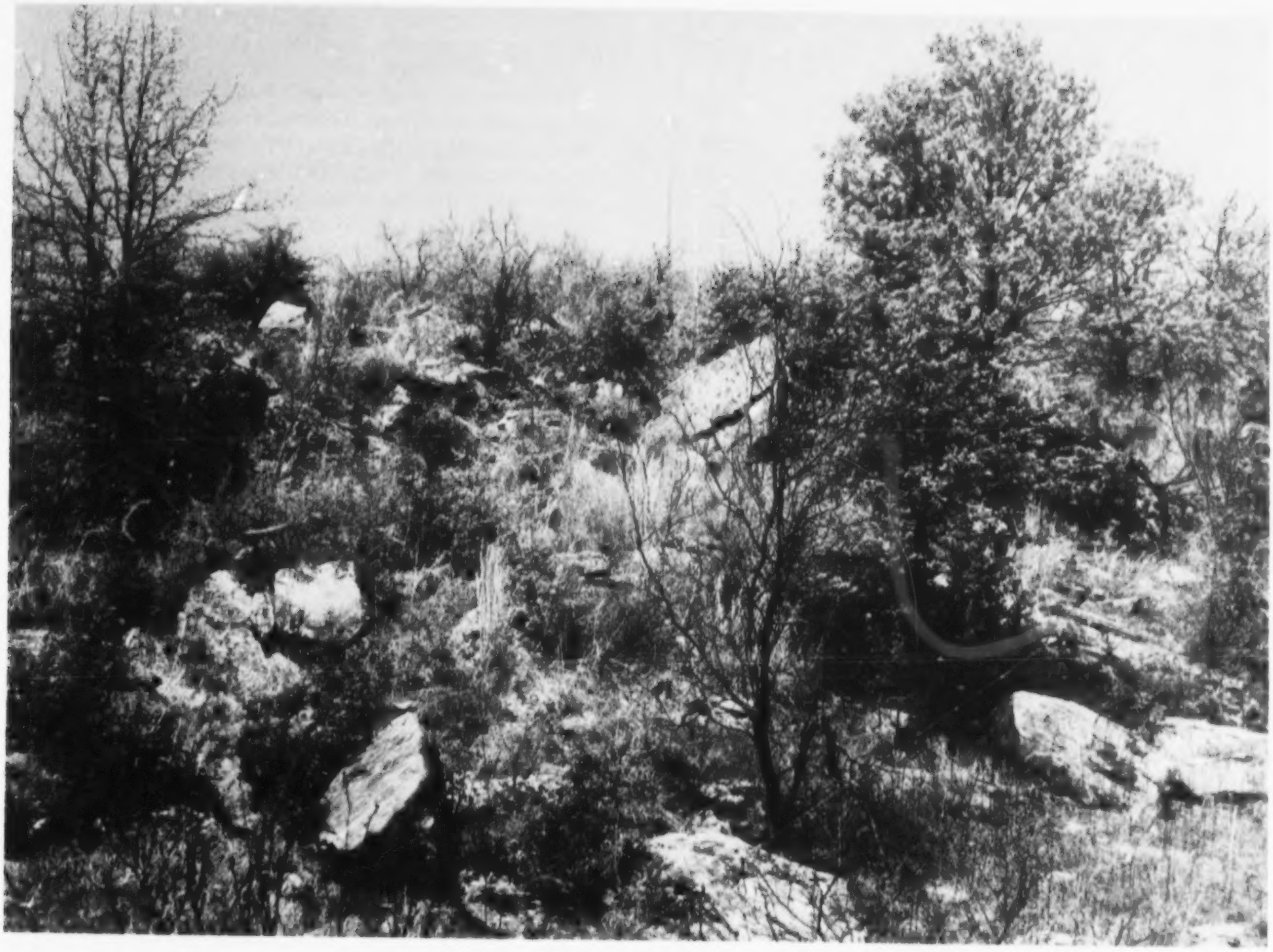


Figure 12.—Large stones limit the use of the soils in the Darnell-Exray complex, very stony, 5 to 20 percent slopes.

The soils in this complex are not suited to pasture and crops. Large stones on the surface, steepness of slope, and the very low available water capacity are limitations.

These soils are poorly suited to urban and recreational uses. Depth to bedrock, steepness of slope, and lack of soil material for septic tank absorption fields are the main limitations.

This complex is in capability subclass VIIs and in the Sandstone Hill range site.

De—Deleon silty clay, frequently flooded. This soil is deep and nearly level. It is on lower, outer parts of wide flood plains. On the average, this soil is flooded 5 or more times every 10 years; flooding generally lasts from 2 to 7 days. The mapped areas are longer than they are wide and range from 7 to several hundred acres. Slope is slightly concave.

Typically, this soil is mildly alkaline, dark grayish brown silty clay to a depth of 30 inches. To a depth of 75 inches it is moderately alkaline, dark brown silty clay. A buried layer of moderately alkaline, very dark grayish brown silty clay loam extends to a depth of 80 inches.

This soil is moderately well drained. Permeability is slow, and the available water capacity is high. Runoff is slow, and the hazards of water erosion and soil blowing are slight. The root zone is deep, but the clayey layers impede penetration by plant roots. Wide cracks form when this soil is dry.

Included with this soil in mapping are small areas of Deleon soils that have a 6- to 15-inch thick overwash of light-colored, loamy material. Also included are soils similar to the Deleon soil; some have loamy horizons 24 inches or more below the surface and others that are in depressions have grayish and brownish mottles within 30 inches of the soil surface. The included soils make up to 30 percent of the map unit.

This Deleon soil is used mainly as pasture. It is well suited to improved bermudagrass, tall fescuegrass, indiangrass, switchgrass, kleingrass, johnsongrass, sweetclover, and singletary peas. Fertilization, weed control, and controlled grazing are pasture management objectives.

This soil is poorly suited to use as cropland because of flooding during the cool-season months. Because of high fertility, many areas of this soil are cultivated to warm-season hay crops and small grains for grazing and hay.

A few areas of this Deleon soil are used as rangeland. Most of the rangeland is wooded.

This soil has fair potential for use as habitat for wildlife. Deer, turkey, dove, quail, and furbearers inhabit areas of this soil. Many choice forage plants for deer and turkey are produced, and excellent resting and escape cover is provided. Waterfowl commonly feed and rest in sloughs and wet depressions.

This soil is not suited to urban and recreational uses because of wetness, permeability, the clayey surface texture, and flooding.

This Deleon soil is in capability subclass Vw and in the Clayey Bottomland range site.

DfC—Duffau loamy fine sand, 1 to 5 percent slopes. This soil is deep and gently sloping. It is on uplands. The mapped areas are irregularly shaped and range from 10 to 130 acres. Slope is smooth to undulating.

Typically, this soil has a brownish loamy fine sand surface layer about 17 inches thick that is slightly acid in the upper part and neutral in the lower part. The subsoil to a depth of 52 inches is slightly acid sandy clay loam that is red in the upper part and yellowish red in the lower part. To a depth of 80 inches, it is neutral, reddish yellow sandy clay loam that has yellowish red and red mottles.

This soil is well drained. Permeability is moderate, and the available water capacity is moderate. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is severe. The root zone is deep and easily penetrated by plant roots.

Included with this soil in mapping are small areas of Heaton, Selden, and Weatherford soils. Heaton soils are in mounded or duned areas, Selden soils are along drainageways or concave spots, and Weatherford soils are on upper slopes. Some small areas of Duffau soils that have slope of 6 percent are also included. The included soils make up to 20 percent of the map unit.

This Duffau soil is used mainly as pasture or rangeland.

This soil is well suited to pasture, mainly improved bermudagrass, weeping lovegrass, switchgrass, arrowleaf clover, vetch, and singletary peas. Weed control, controlled grazing, and timely fertilization are needed to maintain high production of quality forage.

This soil is moderately suited to use as cropland. Peanuts, small grains, and forage sorghums are commonly grown. This soil is also suited to melons, orchards, and vineyards. Crops, such as small grains or sorghum, and residue left on or near the surface protect the soil from blowing and water erosion, conserve moisture, and help maintain soil tilth. Terracing and contour farming are needed in some areas to control water erosion. Fertilizer is needed to maintain crop yields and soil fertility.

This soil has good potential for use as habitat for wildlife. Deer, turkey, squirrel, quail, and dove feed extensively on acorns and other mast. Other small animals and birds feed, nest, and raise their young on this site. Turkeys use the tall grass for nesting. If brush is dense, habitat for most wildlife declines, although deer use the brush for escape and resting cover.

This soil is well suited to most urban uses. It is only moderately suited to recreational uses because of the loose, sandy surface layer.

This Duffau soil is in capability subclass IIIe and in the Loamy Sand range site.

DuB—Duffau fine sandy loam, 1 to 3 percent slopes. This soil is deep and gently sloping. It is on uplands. Slope is smooth and mostly convex or is slightly concave. The mapped areas are broad to irregularly shaped and range from 5 to about 40 acres.

Typically, this soil has a slightly acid, brownish fine sandy loam surface layer about 12 inches thick. The subsoil to a depth of 28 inches is slightly acid, yellowish red sandy clay loam. To a depth of 61 inches it is slightly acid, reddish yellow sandy clay loam that has mottles in shades of red. The next layer to a depth of 69 inches is slightly acid, brownish yellow fine sandy loam that has reddish yellow mottles and a few fragments of weathered sandstone. The underlying material to a depth of 80 inches is slightly acid, very pale brown weakly cemented sandstone.

This soil is well drained. Permeability is moderate, and the available water capacity is high. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is severe in unprotected areas. This soil has good tilth and can be worked throughout a wide range of moisture content. The root zone is deep and easily penetrated by plant roots.

Included with this soil in mapping are small areas of Selden soils in concave areas and closely similar Keeter and Weatherford soils on low ridges. Also included are minor windblown sandy areas and eroded spots of Duffau soils that have no remaining surface layer. A few areas include Duffau soils that have slope of as much as

4 percent. The included soils make up to 15 percent of the map unit.

This Duffau soil is used mainly as pasture. It is well suited to improved bermudagrass, weeping lovegrass, kleingrass, switchgrass, vetch, and arrowleaf clover (fig. 13). Management objectives include fertilization, weed control, and controlled grazing.

This soil is well suited to use as cropland. Peanuts, small grains, hay, and melons are the main crops grown. This soil is also well suited to orchards, truck crops, vineyards, and nursery plants. Terracing and contour farming are needed to slow runoff and reduce water erosion. Crop residue left on or near the surface helps to conserve moisture, control soil blowing, and maintain tilth. Stripcropping with rows at right angles to the prevailing wind direction reduces wind erosion and protects emerging seedlings from sand cutting.

This soil is also used as rangeland. The climax plant community is a post oak and blackjack oak savannah and an understory of mid and tall grasses.

This soil has good potential for use as habitat for wildlife. Deer, dove, quail, turkey, and squirrel inhabit areas of this soil. Several of the woody plants, forbs, and grasses provide good cover and nesting, browse, mast, and seeds for game birds and animals.

This soil is well suited to most urban and recreational uses.

This Duffau soil is in capability subclass IIe and in the Sandy Loam range site.

DvC4—Duffau-Gullied land complex, 3 to 8 percent slopes. This complex consists of eroded, gently sloping to sloping soil on uplands. Vertical-walled gullies, 3 to 65 feet wide and 2 to 20 feet deep, commonly dissect the areas at intervals of 55 to 250 feet (fig. 14). Most mapped areas average about 60 percent Duffau soil, 30 percent gullies, and 10 percent other soils. Only a small part of the surface layer between the gullies is eroded. The mapped areas are irregularly shaped and range from 5 to 150 acres. Slopes are slightly convex and average about 5 percent.

Typically, this Duffau soil has a neutral, light yellowish brown very fine sandy loam surface layer about 8 inches thick. The subsoil to a depth of 48 inches is slightly acid, yellowish red sandy clay loam. To a depth of 80 inches, it is slightly acid, reddish yellow sandy clay loam.

This soil is well drained. Permeability is moderate, and the available water capacity is high. Runoff is medium, and the hazard of erosion is severe. The root zone is deep and is easily penetrated by plant roots.

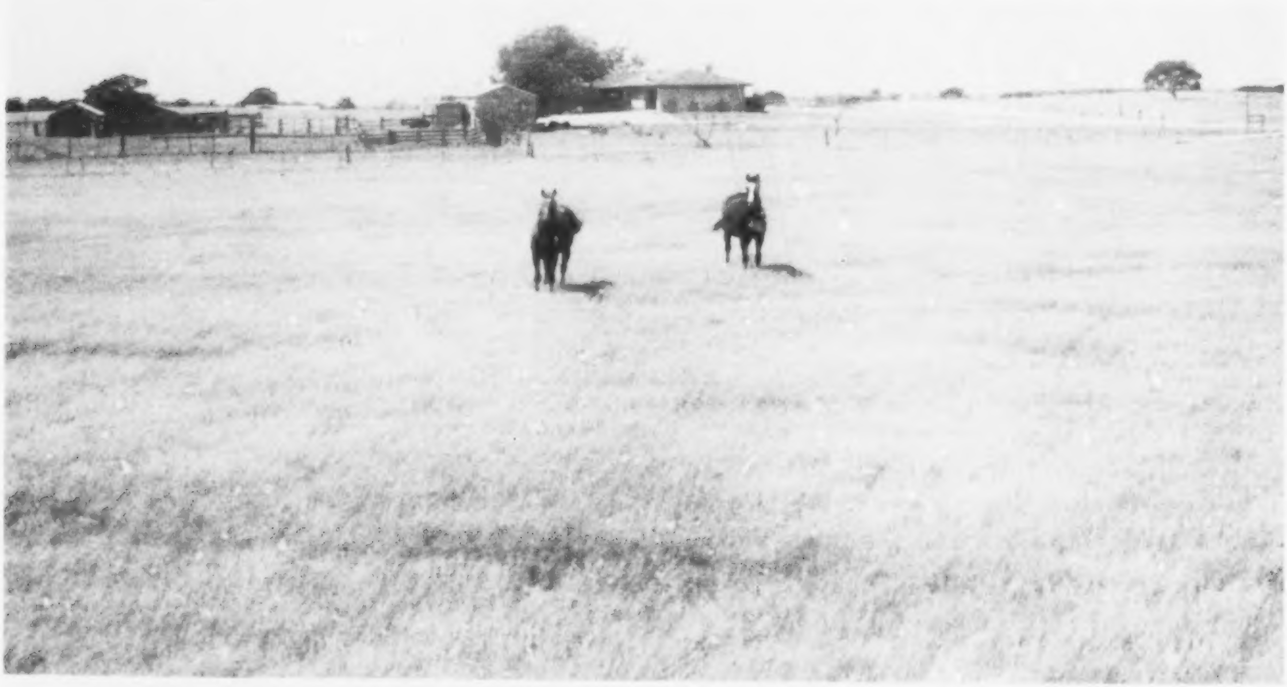


Figure 13.—Duffau fine sandy loam, 1 to 3 percent slopes, is well suited to improved bermudagrass, and many acres are managed for hay.

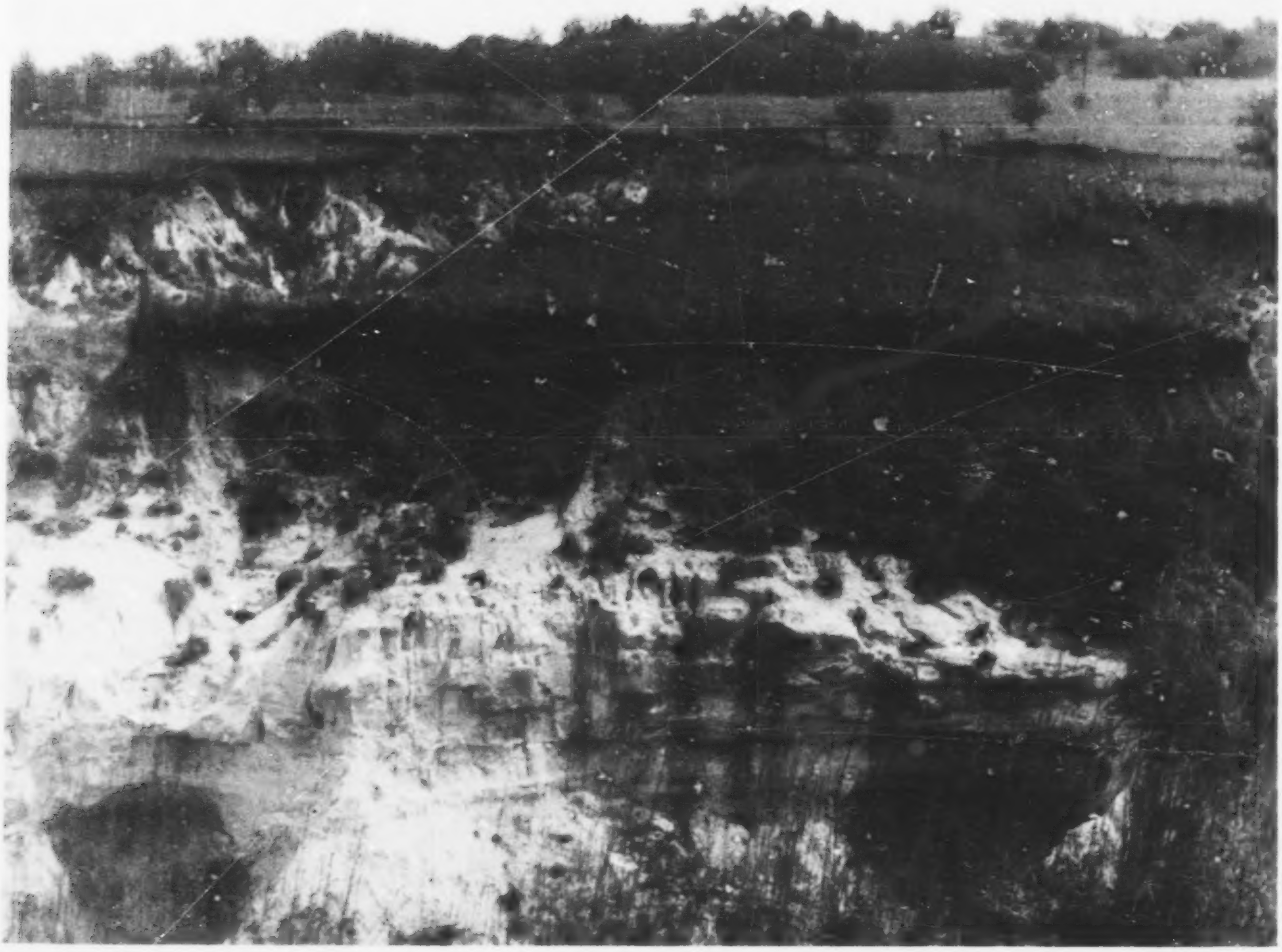


Figure 14.—This area of Duffau-Gullied land complex, 3 to 8 percent slopes, was once a cultivated field. The underlying weakly cemented packsand of the Paluxy Formation is easily eroded by water.

Included in mapping are small spots of gullied Selden soils on lower slopes and in concave areas and closely similar Weatherford soils along the upper slopes. Between the gullies, these included soils retain most of their surface layer. Also included in many mapped areas are Keeter soils on narrow ridges between the gullies. Gullies in the Keeter soils have sloping sides and are shallower than those in the Duffau soil, and erosion has removed nearly all the surface layer from the Keeter soils. Some areas of soils that have been shaped are also included in this map unit. The included soils make up 5 to 25 percent of the map unit.

Because of the deep gullies, the soil in this complex is used as rangeland. This Daffau soil is moderately suited to this use. Overgrazing causes accelerated lengthening and expansion of the gullies. Good grass cover increases rainfall absorption and decreases runoff. Some of the gullies would benefit from planting sod-forming grasses in their channels.

The soil in this complex is moderately suited to pasture, but only after costly shaping of the gullies. It is best suited to sod-forming grasses, such as bermudagrass. The shaping process exposes low fertility and the droughty subsoil. Continuous high levels of fertilizer, weed control, and limited grazing are needed to maintain stands and control erosion.

This soil has fair potential for use as habitat for wildlife. Deer, turkey, dove, and quail feed in the area but mostly use cover on adjacent soils. Turkeys use the tall grasses for nesting.

This soil is poorly suited to crops and to urban and recreational uses because of the deep gullies, the severe hazard of erosion, and steepness of slope.

This complex is in capability subclass VIe and in the Sandy Loam range site.

Fr—Frio silty clay loam, occasionally flooded. This soil is deep and nearly level. It is on flood plains. The soil is inundated occasionally, about once every 3 to 15 years or more, by floods of shallow depth and short duration. Some areas of this soil are protected by levees, but most are protected by floodwater retaining structures. The mapped areas are long and, in most places, narrow and range from about 20 to several hundred acres.

Typically, the plow layer is moderately alkaline, dark grayish brown silty clay loam. It is about 10 inches thick. The next layer to a depth of 40 inches is moderately alkaline, very dark grayish brown and dark grayish brown silty clay. The subsoil to a depth of 80 inches is moderately alkaline, grayish brown and brown clay loam that has threads and concretions of calcium carbonate.

This soil is well drained. Permeability is moderately slow, and the available water capacity is high. Runoff is slow, and the hazard of erosion is slight. This soil has good tilth and can be worked throughout a moderately wide range of moisture content. The root zone is deep and easily penetrated by plant roots.

Included with this soil in mapping are small areas of Pulexas soils along stream channels and the outer edge of the flood plain and small spots of Trinity soils in depressions. Areas of Frio soils that have a light-colored, loamy overwashed surface are near stream channels. Also included are areas of Frio soils that are above flood prevention structures and some low-lying areas of these soils that are frequently flooded. The included soils make up to 15 percent of the map unit.

This Frio soil is used mainly as cropland. It is well suited to small grains, alfalfa, and grain and forage sorghums. Deep-rooted legumes and crops that produce large amounts of residue help meet the major objectives of management to maintain tilth and fertility.

This soil is well suited to pasture, mainly improved bermudagrass, tall fescue, indiangrass, kleingrass, switchgrass, vetch, and singletary peas. Pasture management objectives include fertilization, weed control, and controlled grazing.

This soil is well suited to use as rangeland. Most rangeland areas are small and have an overstory of pecan, elm, hackberry, and oak.

This Frio soil has good potential for use as habitat for wildlife. Deer, turkey, dove, quail, squirrel, and furbearers inhabit areas of this soil. Turkeys commonly roost in the large trees. Many choice forage plants for deer and turkey are produced. Small grains provide additional winter forage.

This soil is not suited to most urban uses because of flooding. It is only moderately suited to most recreational uses because of the silty clay loam surface layer. Because of flooding, this soil is poorly suited to use as campsites.

This Frio soil is in capability subclass IIw and in the Loamy Bottomland range site.

HaB—Hassee fine sandy loam, 0 to 2 percent slopes. This soil is deep and is nearly level and gently sloping. It is in oval to oblong depressions. The mapped areas range from 5 to 50 acres. Slope is mostly concave.

Typically, this soil has a neutral, grayish brown and light gray fine sandy loam surface layer about 11 inches thick. The subsoil to a depth of 34 inches is mildly alkaline, dark gray clay. It is moderately alkaline, dark grayish brown clay to a depth of 48 inches and moderately alkaline, grayish brown clay loam to a depth of 68 inches. The underlying material to a depth of 80 inches is moderately alkaline, light brownish gray clay loam.

This soil is somewhat poorly drained. Permeability is very slow, and the available water capacity is high. The concave areas receive runoff from higher elevations and are ponded occasionally after heavy rainfall. Surface runoff is very slow. The hazards of water erosion and soil blowing are slight. When this soil is dry, a hard surface crust forms. This soil has poor tilth and can be worked only within a narrow range of moisture content. The root zone is deep, but the blocky, clay lower layers severely restrict plant root penetration. This soil has a perched high water table during rainy periods.

Included with this soil in mapping are small areas of Truce and Thurber soils. Truce soils are on upper slopes, and Thurber soils are on plane slopes. Also included are a few small areas of closely similar soils that are in depressions and that have mottles in shades of gray and brown in the upper layers. The included soils are in areas of mostly less than 5 acres and make up less than 15 percent of the map unit.

This Hassee soil is used mainly as rangeland, but a few small areas are cultivated.

The rangeland potential plant community on this soil is mid to short grasses. Mesquite and cactus have invaded some areas.

The main crops on this soil are small grains and forage sorghum. Because of crusting and poor tilth, crop yields are low. Plant residue left on the surface helps to conserve moisture and maintain tilth.

This soil is moderately suited to pasture, mainly improved bermudagrass and kleingrass.

This Hassee soil has fair potential for use as habitat for wildlife. Dove, quail, rabbit, and deer inhabit areas of this soil. Ample food for birds is produced. Small grains provide supplemental grazing for deer.

This soil is poorly suited to most urban uses because of wetness, very slow permeability, and shrinking and swelling. These limitations are difficult to overcome.

This soil is poorly suited to most recreational uses because of wetness and very slow permeability.

This Hassee soil is in capability subclass IIIw and in the Claypan Prairie range site.

HeB—Hensley very stony loam, 1 to 3 percent slopes. This soil is shallow and gently sloping. It is on upland slopes and ridges. Limestone fragments as much as 40 inches in diameter cover 3 to 20 percent of the surface. The mapped areas are irregularly shaped and range from 15 to about 200 acres. Slope is plane to convex and averages about 2 percent.

Typically, this soil has a neutral, dark brown very stony loam surface layer about 4 inches thick. It has about 20 percent gravel, cobbles, and stones of limestone on the surface and imbedded in this layer. The subsoil to a depth of 10 inches is neutral, red clay loam and to a depth of 18 inches is neutral, dark red clay loam. The underlying material to a depth of 22 inches is very hard, fractured limestone that has reddish clay and roots in the fractures.

This soil is well drained. Permeability is slow, and the available water capacity is very low. Surface runoff is medium, and the hazard of water erosion is moderate. The shallow depth to limestone limits the depth roots can penetrate. The surface fragments help to conserve moisture by slowing evaporation.

Included with this soil in mapping are small areas of the closely similar Lindy and Palopinto soils. Another closely similar soil has a subsoil that is not as red as that of the Hensley soil. Also included are a few spots of Hensley soils that have only a few or no stones on the surface. The included soils make up 10 to 25 percent of the map unit.

The Hensley soil is used as rangeland. Brush, which has invaded many areas, and the shallow depth to limestone limit production. In a few areas, the underlying limestone is quarried and crushed.

This soil has fair potential for use as habitat for wildlife. Quail and dove prefer this area because it provides good cover and a variety of seed plants. Brushy areas provide habitat for deer and turkey.

This soil is poorly suited to crops and pasture because of large stones and the very low available water capacity. A few areas of this soil that do not have large stones are cultivated to small grains.

This soil is poorly suited to most urban and recreational uses because of the depth to limestone, large stones on the surface, and corrosivity to uncoated steel. This soil is poorly suited to septic tank absorption fields.

This Hensley soil is in capability subclass VIs and in the Redland range site.

KtC—Keeter very fine sandy loam, 1 to 6 percent slopes. This soil is deep and gently sloping. It is on ridges of interstream divides. Deep drainageways commonly dissect the side slopes. The mapped areas are irregularly shaped to elongated and follow the contour of the ridges. The areas range from 5 to more than 80 acres. Slope is convex and is commonly less than 3 percent.

Typically, this soil has a slightly acid, very fine sandy loam surface layer about 7 inches thick. This layer is brown in the upper part and light brown in the lower part. The subsoil to a depth of 23 inches is strongly acid, red clay loam and to a depth of 28 inches is medium acid, reddish yellow clay loam that has mottles in shades of red and brown. The lower part of the subsoil to a depth of 33 inches is medium acid, reddish yellow and very pale brown, mottled, very fine sandy loam that has fragments of weathered sandstone. The underlying material to a depth of 72 inches is stratified very pale brown and white, very weakly cemented sandstone that is slightly acid in the upper part and mildly alkaline in the lower part.

This soil is well drained. Permeability is moderately slow, and the available water capacity is moderate. Runoff is medium to rapid, and the hazard of water erosion is severe. The hazard of soil blowing is severe in areas left bare. The root zone is moderately deep. The blocky peds in the subsoil are encased with thick, clay coats that impede the penetration of roots, air, and water.

Included with this soil in mapping are Duffau and Weatherford soils in small concave areas. Some areas have narrow bands of Windthorst soils on side slopes. A soil that has a more clayey subsoil than the Keeter soil and is less than 35 inches thick to shaly clay or clay is on or near ridgetops. Most mapped areas have spots, as large as 8 acres in size, of soils that have lost most of their surface layer as a result of erosion. The included soils make up about 20 percent of the map unit, but in a few mapped areas, the percentage of Windthorst and other soils that have a clayey subsoil is higher.

This soil is used mainly as pasture or rangeland.

This soil is moderately suited to pasture, mainly improved bermudagrass, lovegrass, kleingrass, arrowleaf clover, and singletary peas. Droughtiness is a problem. Seedbed preparation is easy, but if the soil is left bare, it is subject to severe water and wind erosion.

Only a small acreage of this Keeter soil is used as cropland. This soil is only moderately suited to locally-grown crops, such as small grains, peanuts, and forage sorghum. Droughtiness, the severe erosion hazard, and surface crusting are the main limitations. Most areas that can be cropped are limited in size by deep, natural drainageways. Water erosion is difficult to control because of inadequate natural outlets for terraces and waterways. Crops that produce large amounts of residue and residue left on the surface help conserve moisture, reduce crusting and soil blowing, and improve soil tilth.

This soil has good potential for use as habitat for wildlife. A wide variety of native forbs, bushes, and grasses provide food and cover for deer, turkey, and small game birds.

This soil is only moderately suited to most urban and recreational uses because of the shrinking and swelling of the upper part of the subsoil resulting from changes in moisture content, the steepness of slope, and the corrosivity to uncoated steel. In steeper areas, the depth to the weakly cemented sandstone can cause septic effluent to seep to the surface. These limitations can be overcome by good design and proper installation of urban structures. Steepness of slope and soil blowing of the very fine sandy loam surface layer are limitations for recreational uses.

This Keeter soil is in capability subclass IVe and in the Tight Sandy Loam range site.

KtC3—Keeter very fine sandy loam, 2 to 6 percent slopes, eroded. This soil is deep and gently sloping. It is on convex ridgetops, mostly in old cultivated fields. This soil has lost most of its surface layer as a result of erosion, and the reddish subsoil is exposed in many places. Shallow gullies, mainly less than 2 feet deep, and rills cross the more sloping areas. The mapped areas range from 5 to about 30 acres. Slope is convex and averages about 4 percent.

Typically, the remaining surface layer of this Keeter soil is about 3 inches thick. It is neutral, brown very fine sandy loam. The subsoil to a depth of 11 inches is medium acid, reddish brown sandy clay and to a depth of 18 inches is slightly acid, yellowish red sandy clay that has red mottles. The lower part of the subsoil to a depth of 38 inches is slightly acid sandy clay loam that grades to very fine sandy loam. It is reddish yellow with mottles in shades of brown and yellow. The underlying material to a depth of 55 inches is mildly alkaline, very pale brown, fractured, weakly cemented sandstone. To a depth of 72 inches the weakly cemented sandstone is white and has thin strata of moderately alkaline, light gray shale.

This soil is well drained. Permeability is moderately slow, and the available water capacity is moderate. Runoff is rapid, and the hazards of water erosion and soil blowing are severe in unprotected areas. This soil is droughty because most of the surface layer has been removed by erosion and the rapid runoff does not allow much moisture to enter the blocky subsoil. The root zone is moderately deep, but roots have difficulty penetrating the upper part of the subsoil.

Included with this soil in mapping are small areas of eroded Weatherford and Windthorst soils. Another eroded soil that is similar to the Keeter soil but has a thinner, more clayey solum is also included. Small spots of Keeter soils that are not eroded are in some mapped areas. The included soils make up to 30 percent of the map unit.

Because past erosion has reduced the fertility level and water holding capacity of this Keeter soil, it is now used mainly as unimproved rangeland.

This soil has fair potential for use as habitat for deer, dove, quail, and songbirds. Food and cover are limited because of eroded soils.

This soil is poorly suited to pasture. Bermudagrass, weeping lovegrass, kleingrass, and vetch are grown, but forage production is limited. Seedbeds are difficult to prepare because of the eroded surface layer. After rains, a thick surface crust forms as the soil dries. This crust impedes the emergence of seedlings. Without the use of fertilizer to maintain plant vigor, erosion may continue between the scattered clumps of plants. During periods of extended drought, plants growing on the more severely eroded soil commonly die.

Most of this soil is poorly suited to use as cropland because of the eroded areas, low fertility, and droughtiness. The absence of stable natural outlets for concentrated water from terraces and waterways is also a limitation.

This soil is moderately suited to most urban and recreational uses. Changes in moisture content cause moderate shrinking and swelling of the upper part of the subsoil. Other limitations are steepness of slope and corrosivity to uncoated steel. Extra topsoil is needed for lawns and shrubbery. Steepness of slope, soil blowing, or an exposed subsoil are limitations for recreational uses.

This Keeter soil is in capability subclass IVe and in the Tight Sandy Loam range site.

LnB—Lindy loam, 1 to 3 percent slopes. This soil is moderately deep and gently sloping. It is on uplands. The mapped areas are oblong to irregularly shaped and range from 5 to 160 acres. Slope is mainly smooth or convex.

Typically, this soil has a neutral, reddish brown loam surface layer about 6 inches thick. The subsoil to a depth of 24 inches is neutral, reddish brown clay loam in the upper part and clay in the lower part. It is underlain by hard limestone that is fractured in the upper few inches.

This soil is well drained. Permeability is slow, and the available water capacity is low. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. The root zone is moderately deep; however, the clayey subsoil impedes root penetration.

Included with this soil in mapping are small spots of Hassee, Hensley, and Truce soils. Hassee soils are in lower concave areas than Lindy soil. Hensley and Truce soils are on narrow ridges and in other more sloping areas. The included soils make up less than 20 percent of the map unit.

This Lindy soil is mainly used as rangeland. It is also used for improved pasture and for small grains and sorghum. In a few areas, the limestone under this soil is quarried and crushed.

This soil is only moderately suited to pasture because the moderate depth to bedrock restricts the amount of moisture available for plant use. Kleingrass, weeping lovegrass, and plains bluestem are suitable pasture plants.

This soil is moderately suited to use as cropland. Crops grown during the cool season are better suited because of the limited available moisture. Terraces and contour farming help to control erosion. Crop residue left on the surface lowers soil temperature, conserves moisture, reduces runoff and soil blowing, and maintains soil tilth.

This Lindy soil has fair potential for use as habitat for wildlife. The plant food and cover on this soil provide good habitat for small game birds. Inadequate woody cover for escape may limit deer use to dusk and night time. Brushy areas provide good habitat for dove and deer.

This soil is only moderately suited to most urban uses because of the depth to bedrock, shrinking and swelling with changes in moisture content, and corrosivity to uncoated steel.

This soil is well suited to most recreational uses, but maintaining a good cover is essential to prevent soil erosion.

This Lindy soil is in capability subclass IIIe and in the Deep Redland range site.

MaB—May fine sandy loam, 0 to 2 percent slopes. This soil is deep and is nearly level and gently sloping. It is on stream terraces and in valleys. The mapped areas are long and narrow and range from 8 to 25 acres.

Typically, this soil has a slightly acid fine sandy loam surface layer about 14 inches thick. It is grayish brown in the upper part and dark grayish brown in the lower part. The subsoil to a depth of 42 inches is neutral, brown sandy clay loam in the upper part and grades to brown clay loam in the lower part. To a depth of 64 inches it is moderately alkaline, yellowish brown sandy clay loam that has threads and concretions of calcium carbonate.

This soil is well drained. Permeability is moderate, and the available water capacity is moderate. Runoff is slow. The hazards of water erosion and soil blowing are moderate. This soil receives additional moisture as runoff from other soils that are higher on the landscape. May soil can be worked throughout a wide range of moisture content. The root zone is deep and easily penetrated by roots. This soil responds well to fertilizer.

Included with this soil in mapping are small areas, less than 5 acres in size, of Pulexas soils on narrow flood plains and Duffau soils on low ridges. The included soils make up less than 10 percent of the map unit.

This May soil is used as cropland and is well suited to sorghum, truck crops, pecan orchards, peanuts, and small grains. Crop residue left on the surface helps to conserve moisture, reduce soil temperature, and maintain soil tilth and productivity.

This soil is well suited to pasture, mainly improved bermudagrass, plains and old world bluestems, arrowleaf clover, and kleingrass.

This soil is also used as rangeland. The better managed areas of this soil have a scattering of oak, elm, and pecan trees and an understory of mid and tall grasses and forbs.

This soil has good potential for use as habitat for wildlife. Deer, turkey, quail, and dove inhabit areas of this soil. Several of the native woody plants, forbs, and grasses provide good cover, browse, mast, and seeds for game birds and animals. The tall grass makes an excellent nesting site for turkeys.

This soil is well suited to most urban and recreational uses.

This May soil is in capability subclass IIe and in the Sandy Loam range site.

MdE—Medlin-Sanger stony clays, 5 to 15 percent slopes. These soils are sloping to moderately steep. They are on convex side slopes below limestone caprock. Outcrops of thinly layered limestone strata that occur within each 10- to 20-foot change in elevation give these soils a terraced or benched appearance. As these strata and the higher caprock weather, fragments and stones are dislodged and creep or slip downslope. These fragments of flaggy limestone range from less than 3 inches to more than 30 inches across the long axis. The fragments and stones are mostly on the soil surface on upper slopes and are imbedded and buried in the soils on lower slopes. The mapped areas are longer than they are wide and follow the contour of the landscape. They range from 5 to more than 200 acres.

This map unit is about 60 percent Medlin soil, 35 percent Sanger soil, and about 5 percent other soils. These soils are too intricately mixed to be mapped separately at the selected scale.

Typically, the Medlin soil is on mid and lower slopes. It has a moderately alkaline, dark grayish brown stony clay and grayish brown clay surface layer about 13 inches thick. The subsoil to a depth of 44 inches is moderately alkaline clay that is light olive brown in the upper part and light yellowish brown in the lower part. The underlying material to a depth of 60 inches is moderately alkaline, light olive brown, brownish yellow, and light olive gray stratified shaly clay.

Typically, the Sanger soil is on lower slopes than the Medlin soil. It has a moderately alkaline, dark grayish brown stony clay surface layer about 16 inches thick. The subsoil to a depth of 44 inches is moderately alkaline clay that is grayish brown in the upper part and light olive brown in the lower part. The underlying material to a depth of 62 inches is moderately alkaline, light olive brown shaly clay that has a few fragments of limestone and marine shell.

The Medlin and Sanger soils are well drained. Permeability is very slow, and the available water capacity is high. When the soils are dry, deep, wide cracks form. Water enters the soil rapidly when the soil is cracked. When the soil is wet, the cracks are sealed and water enters the soil very slowly. Runoff then becomes rapid, and the hazard of erosion is increased in unprotected areas. Shrinking and swelling of the soil has caused some flaggy rocks to tilt and protrude from the soil in a vertical position.

Included with these soils in mapping are small bands of Aledo, Bolar, and Somervell soils. These soils are on benches above thin layers of limestone outcrops.

The soils in this map unit are used mostly as rangeland. Mid and tall grasses are dominant in most areas.

These soils have fair potential for use as habitat for wildlife. Coyote, rabbit, quail, and dove utilize these areas. Excessive grazing reduces habitat for wildlife.

In a few less sloping areas, these soils are used for wheat and forage sorghum. Most of these soils are poorly suited to crops and pasture because of the stony surface, steep slopes, and severe erosion hazard.

These soils are poorly suited to urban and recreational uses. Stones, steep slopes, severe erosion hazard, shrinking and swelling resulting from changes in moisture content, permeability, and corrosivity to uncoated steel are limitations. Soil slippage is likely where deep cuts are made across the slope.

The Medlin and Sanger soils are in capability subclass VIs and in the Blackland range site.

MoB—Mingo silty clay loam, 1 to 3 percent slopes. This soil is moderately deep and gently sloping. It is on convex side slopes. The mapped areas are subrounded and range from about 6 to 30 acres.

Typically, the surface layer is neutral, dark grayish brown silty clay loam about 7 inches thick. The subsoil to a depth of 33 inches is mildly alkaline silty clay that is dark grayish brown in the upper part and dark brown in the lower part. It is underlain by coarsely fractured limestone.

This soil is well drained. Permeability is very slow, and the available water capacity is low. Runoff is slow to medium, and the hazard of water erosion is moderate. The root zone is moderately deep, but penetration is impeded by the underlying clayey layers. The soil is difficult to work at extremes in moisture content.

Included with this soil in mapping are small areas of San Saba and Speck soils along the outer edge of delineations and Ponder soils in lower concave areas. The included soils make up as much as 15 percent of the map unit.

This Mingo soil is moderately suited to use as cropland. The major crops are sorghums and small grains. Depth to limestone limits available moisture. Crop residue left near the surface improves tilth and conserves moisture. Deep-rooted legumes aerate the soil and add nitrogen.

This soil is moderately suited to pasture, mainly kleingrass, improved bermudagrass, weeping lovegrass, johnsongrass, and vetch. Pasture management objectives include weed control, fertilization, and controlled grazing.

This soil is also used as rangeland. The forage produced is nutritious, and livestock tend to overgraze.

This soil has fair potential for use as habitat for wildlife. Small game birds and animals use the area if cover is adequate. Crop residue and waste provide temporary food and cover in some areas. Excessive grazing reduces yearlong food and cover for wildlife.

This soil is only moderately suited to most urban uses because of depth to bedrock, corrosivity to uncoated steel, and shrinking and swelling resulting from changes in moisture content. The limestone bedrock is difficult to excavate. This soil is poorly suited to septic tank absorption fields because the clayey subsoil and the bedrock restrict permeability.

This soil is moderately suited to recreational use. The silty clay loam surface layer and the very slow permeability are the main limitations for this use.

This Mingo soil is in capability subclass IIIe and in the Deep Redland range site.

NdB—Nimrod fine sand, 1 to 4 percent slopes. This soil is deep and gently sloping. It is on ridges and side slopes. The mapped areas are subrounded and range from 15 to several hundred acres. Slope averages about 2 percent.

Typically, this soil has a fine sand surface layer about 24 inches thick. The upper part is slightly acid and pale brown, and the lower part is neutral and is very pale brown with light yellowish brown mottles. The subsoil to a depth of 32 inches is medium acid, brownish yellow sandy clay loam that has reddish yellow, red, and light brownish gray mottles. To a depth of 62 inches it is strongly acid, sandy clay loam that is mottled in shades of gray, brown, red, and yellow. The underlying material to a depth of 80 inches is strongly acid, reddish yellow, brittle sandy loam that has light gray and pink mottles.

This soil is moderately well drained. Permeability is moderately slow, and the available water capacity is moderate. The surface layer rapidly absorbs rainfall. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is severe. For short periods following heavy rainfall, a perched high water table is at the top of the subsoil layer. The root zone is deep.

Included with this soil in mapping are small, scattered spots of Chaney, Cisco, and Selden soils. The included soils make up as much as 15 percent of the map unit.

This soil is used mainly as pasture and is well suited to this use. Improved bermudagrass, weeping lovegrass, switchgrass, vetch, and arrowleaf clover are commonly grown. Management concerns include fertilization at planned intervals throughout the grazing season, weed control, and controlled grazing.

This soil is also used as rangeland. The climax plant community is a post oak and blackjack oak savannah with tall and mid grasses. Woody plants increase as range deteriorates from overgrazing.

This soil is moderately suited to cropland. Low natural fertility limits production. Corn, small grains, peanuts, and watermelons are grown. The major objectives in management are controlling soil blowing (fig. 15), conserving soil moisture, and improving soil fertility. Planting crops that produce large amounts of residue, stripcropping, and fertilizing help control soil blowing and improve fertility.

This soil has good potential for use as habitat for wildlife. Deer, turkey, quail, and dove inhabit areas of this soil. If brush is dense, habitat for most wildlife declines because of scarse forage. Brush controlled in patterns or strips increases food for wildlife. Deer also use the areas of thick brush for escape and resting cover.

This soil is well suited to most urban uses. The perched water table and corrosivity to uncoated steel and concrete are limitations that can be overcome by good design and proper installation of urban structures. Moderately slow permeability restricts the use of this soil for septic tank absorption systems. The fine sand surface layer commonly allows effluent to seep to the surface.

This soil is poorly suited to most recreational uses. The fine sand surface layer, which blows when the soil is left bare, is the main limitation.

This Nimrod soil is in the capability subclass IIIe and in the Sandy range site.

OwE—Owens very stony clay, 8 to 30 percent slopes. This soil is deep and strongly sloping to steep. It is on hillsides. Limestone and sandstone fragments, 6 to 48 inches in diameter, cover 3 to 10 percent of the surface. The mapped areas are irregularly shaped and

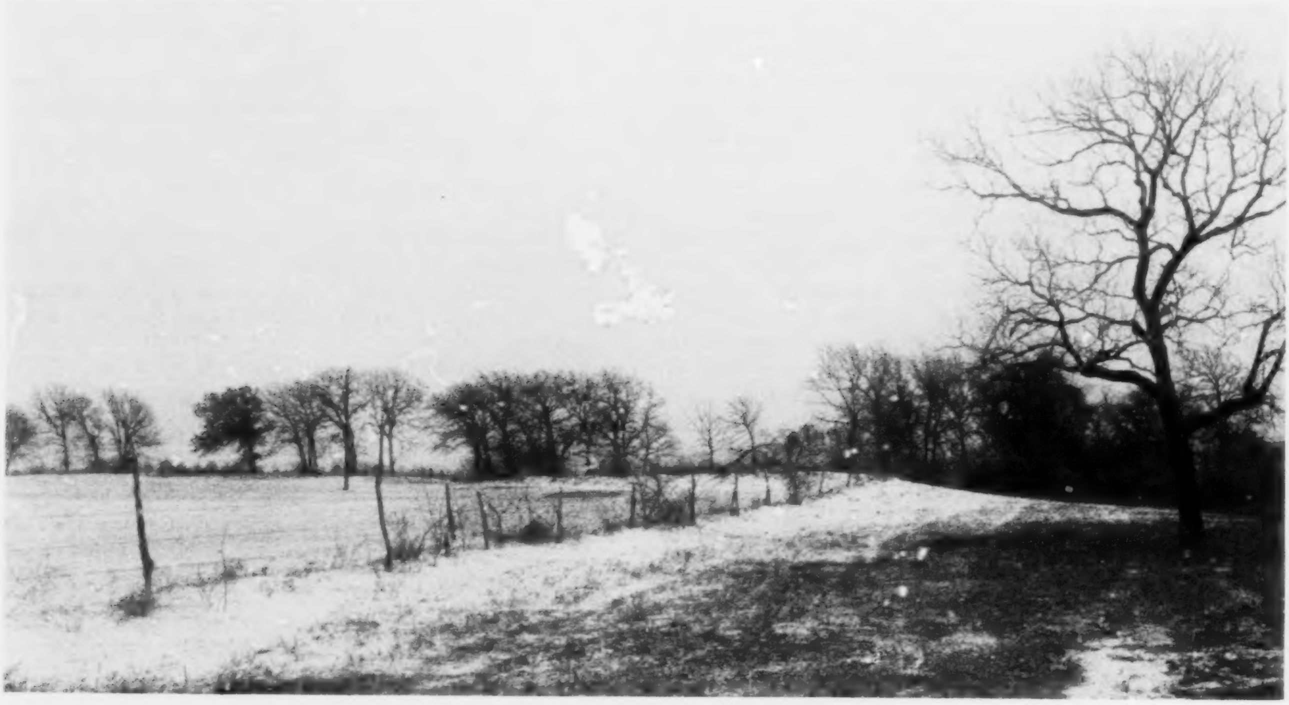


Figure 15.—Wind erosion is a severe hazard on Nimrod fine sand, 1 to 4 percent slopes. Sand from a peanut field that was left bare after harvest has accumulated along the fence row.

are generally on south-facing slopes. They range from 15 to 150 acres.

Typically, this soil has a moderately alkaline, grayish brown very stony clay surface layer about 7 inches thick. Limestone fragments, 6 to 30 inches in diameter, cover 8 percent of the soil surface. The subsoil to a depth of 18 inches is moderately alkaline, light olive brown clay. The underlying material to a depth of 40 inches is moderately alkaline, mottled light olive brown and grayish brown shaly clay that has mottles in shades of gray and yellow.

Owens soil and closely similar soils make up more than 70 percent of this map unit. Permeability is very slow, and the available water capacity is low. Runoff is rapid. Most rainfall runs off before it can enter the soil. The root zone is shallow to moderately deep. The hazard of water erosion is severe, and the hazard of soil blowing is slight.

Included with this soil in mapping are small spots of exposed shaly material, extremely stony areas, and rock outcrops. Also included in some areas are small spots of a soil that has a noncalcareous surface layer but otherwise is closely similar to the Owens soil. These closely similar soils make up less than 30 percent of the map unit. Stony Cona and Set soils are included in some concave areas.

This Owens soil is used as rangeland. The climax plant community is short and mid grasses. Proper grazing is needed to maintain enough vegetation to cover the soil. Excessive grazing, trampling, and removal of surface litter causes the soil to become drier and less able to absorb moisture. Continuous overgrazing causes the soil to erode. Stoniness and steep slopes limit livestock accessibility in some areas.

This soil has poor potential for use as habitat for wildlife. Scarcity of food and cover is the main limitation.

This Owens soil is not suited to crops or pasture.

This soil is poorly suited to urban and recreational uses. Steepness of slope, stones, and shallow soil depth are limitations. Soil slippage is likely if soil cuts are made across the slope.

This Owens soil is in capability subclass VIIs and in the Rocky Hill range site.

PaC—Palopinto extremely stony silty clay loam, 1 to 8 percent slopes. This soil is very shallow and shallow. It is on gently sloping to sloping uplands above drainageways and ridgetops. Many limestone fragments are on the surface (fig. 16). The mapped areas are elongated to irregularly shaped.

Typically, this soil is 15 inches thick to limestone. It is mildly alkaline, dark brown and reddish brown extremely stony silty clay loam that has 25 to 90 percent limestone fragments that are about 6 to 48 inches across. The underlying material is coarsely fractured indurated limestone.

This soil is well drained. Permeability is moderate, and the available water capacity is very low. Runoff is rapid, and the hazard of water erosion is slight because of rock fragments on the surface. Rooting depth is limited by the amount and depth of fractures in the limestone bedrock.

Included with this soil in mapping are small areas of Hensley soils in concave areas on ridgetops, Set soils along drainageways, and rock outcrop. Some areas of Palopinto soils that have long and narrow slopes of more than 8 percent are also included. The included soils make up less than 25 percent of the map unit.

This Palopinto soil is used as rangeland. Thick brush has invaded many areas. Some areas have short and mid grasses and a few live oak trees.

This soil has fair potential for use as habitat for wildlife. Areas of this soil are inhabited by deer, turkey, dove, and quail.

This soil is poorly suited to crops, pasture, and urban and recreational uses. Shallow depth to hard limestone and large fragments on the soil surface are limitations.

This Palopinto soil is in capability subclass VIs and in the Low Stony Hill range site.

PhC—Patilo-Heaton fine sands, 3 to 12 percent slopes. These soils are deep. They are on gently sloping to strongly sloping uplands. The landscape is smooth to gently rolling. Few to common drainageways are in some areas of these soils. The mapped areas are oblong and range from 5 to about 150 acres. Slope is convex and concave and averages about 5 percent.

This map unit is about 50 percent Patilo soil and other closely similar soils, 35 percent Heaton soil and other closely similar soils, and 15 percent dissimilar soils. The soils in this complex are too intricately mixed to be mapped separately at the selected scale.

Patilo soil is in concave areas on foot slopes and along drainageways. Typically, the surface layer is 43 inches thick. It is neutral, brown fine sand to a depth of 10 inches and slightly acid, very pale brown fine sand below that depth. The subsoil to a depth of 80 inches is slightly acid, light gray sandy clay loam that has mottles in shades of brown, yellow, and red.

The Patilo soil is moderately well drained. Permeability is moderately slow, and the available water capacity is slight. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is severe. The root zone is deep and easily penetrated by plant roots. A perched high water table is above the subsoil following periods of high precipitation.

The Heaton soil is in convex areas on mid and upper slopes. Typically, the surface layer is 24 inches thick. It is slightly acid, brown fine sand to a depth of 10 inches and neutral, light yellowish brown fine sand below that depth. The subsoil to a depth of 38 inches is slightly acid, yellowish red sandy clay loam. To a depth of 77 inches it is reddish yellow sandy clay loam that is slightly acid in the upper part and neutral in the lower part.

The Heaton soil is well drained. Permeability is moderate, and the available water capacity is moderate.

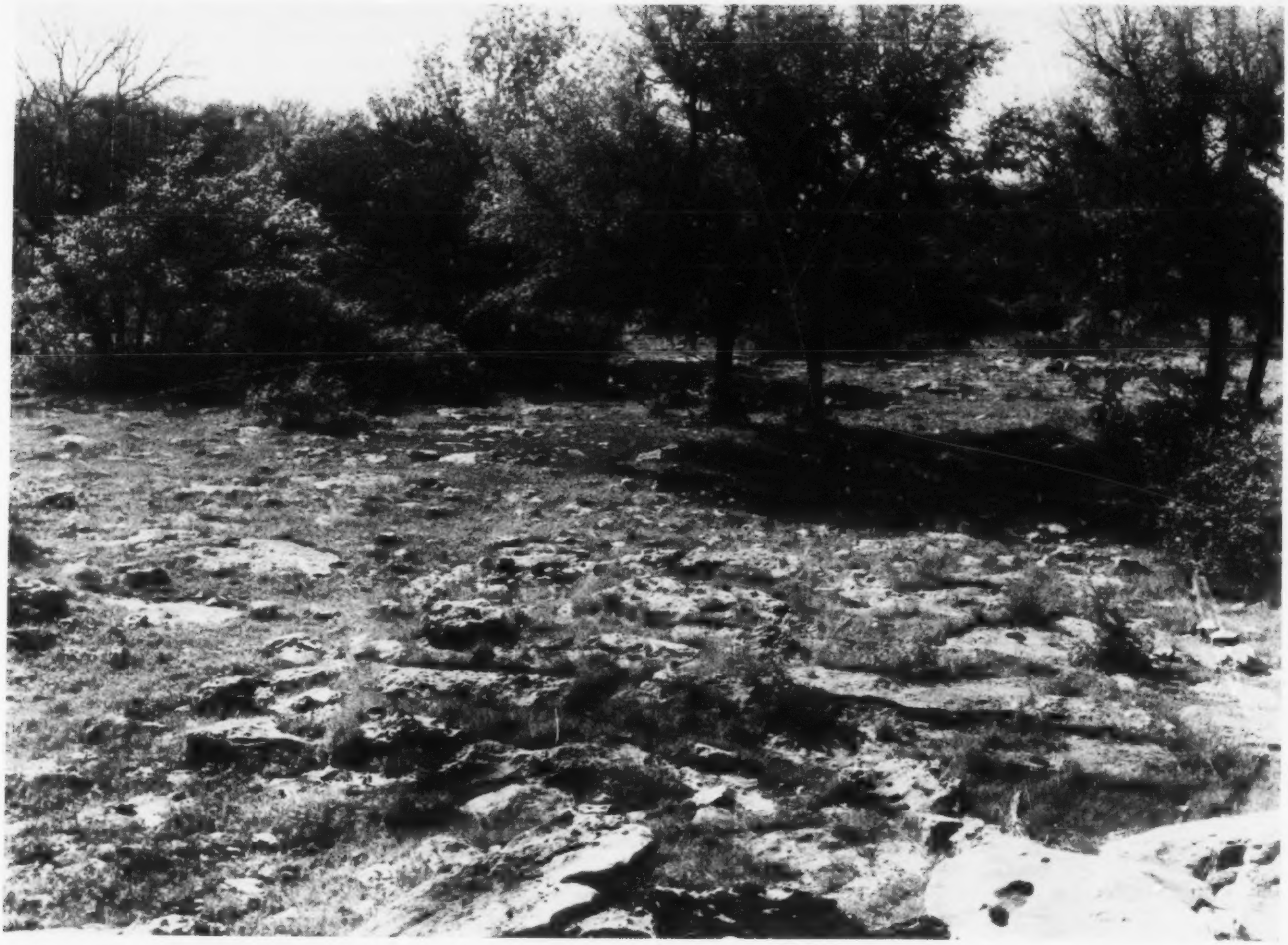


Figure 16.—This area of Palopinto extremely stony silty clay loam, 1 to 8 percent slopes, has a large amount of exposed limestone.

Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is severe in unprotected areas. The root zone is deep and is easily penetrated by plant roots.

Included in mapping are areas of Nimrod and Weatherford soils. These soils are closely similar to the Patilo and Heaton soils. A soil similar to the Heaton soil but differs by having a fine sand surface layer 40 to 60 inches thick is also included. These closely similar soils make up 20 to 40 percent of most areas. Also included in a few areas on upper slopes are soils that are fine sand to a depth of more than 72 inches and other sandy soils that have scattered lamellae bands, as much as 1 inch thick, below a depth of 35 inches. The bands are reddish and yellowish sandy loam and sandy clay loam. These included soils make up 10 to 20 percent of the map unit. Areas mapped along Denton Creek have a higher percentage of the included soils.

The Patilo and Heaton soils are used mainly as rangeland or pasture, or the surface is mined for use as fill material.

These soils are only moderately suited to use as rangeland. The rangeland has been continuously overgrazed for so long that woody vegetation dominates most areas.

These soils have fair potential for use as habitat for wildlife. Deer, squirrel, and turkey are the main species. Deer use the thick, brushy areas for escape and resting. Brush maintained in patterns or strips increases wildlife food and allows cover.

These soils are moderately suited to pasture, mainly improved bermudagrass, indiangrass, switchgrass, and weeping lovegrass. Seedling grasses are difficult to establish because of blowing sand and the difficulty in obtaining a firm seedbed. Fertilizer is needed for sustained forage production, and applications need to be split and applied at planned intervals throughout the growing season.

These soils are only moderately suited to use as cropland. The low available water capacity, sloping topography, and thick, erosive sandy surface are the main limitations. Peanuts, watermelons, peaches, and other truck crops are grown. Crop residue left on the surface helps maintain organic matter and control soil blowing.

These soils are only moderately suited to most urban uses and are poorly suited to most recreational uses. The main limitations are steepness of slope and the deep, loose sand that blows when the surface is bare. These soils are poorly suited to use as septic tank absorption fields because of the permeability and the seeping of effluent to the surface. A seasonal water table limits the use of the Patilo soil for septic tank absorption fields and buildings with basements.

The Patilo and Heaton soils are in capability subclass IVe. Patilo soil is in the Deep Sand range site, and Heaton soil is in the Sandy range site.

Po—Pits, quarries. These are areas where limestone has been or is being mined. These areas include piles of the overburden that was removed to get to the limestone, large stockpiles of crushed limestone, and the excavated pit (fig. 17). Also included is an area mined for clay to make bricks and an area that was a coal mine. Depth of the pits ranges from about 8 to over 100 feet. The overburden consists of clayey, shaly, and loamy soil material mixed with limestone rocks. The mapped areas range from 6 to more than 1,000 acres.

Most of these rock pits remain open. Little effort has been made to reclaim them. Most are increasing in size, and many contain water.

These areas are not suited to rangeland, pasture, cropland, or urban uses.

The potential is poor for use as habitat for wildlife, except for fish.

These areas are poorly suited to recreational uses, although some areas are ideal for certain kinds of recreational activity.

These areas are not assigned a capability subclass or range site.

PrB—Ponder clay loam, 1 to 3 percent slopes. This soil is deep and gently sloping. It is on low convex side slopes and ancient stream terraces on uplands. The mapped areas are smooth and subrounded. They range from 5 to about 50 acres.

Typically, this soil has a neutral, dark grayish brown clay loam surface layer about 7 inches thick. The subsoil to a depth of 17 inches is neutral, brown clay. To a depth of 54 inches it is moderately alkaline, light olive brown and yellowish brown clay, and to a depth of 80 inches it is moderately alkaline, reddish yellow silty clay loam that has soft masses of calcium carbonate.

This soil is moderately well drained. Permeability is slow, and the available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate. The surface layer is very hard and difficult to till when it is dry. The root zone is deep, but the clayey subsoil impedes plant root penetration.

Included with this soil in mapping are small areas of Sanger soils on upper side slopes of ridges and nearly level Ponder clay loam on ridgetops. The included soils make up as much as 15 percent of the map unit.

This Ponder soil is used mainly as cropland, but it is only moderately suited to the production of crops. The clayey subsoil releases moisture slowly causing the soil to be somewhat droughty. Grain sorghum and small grains are grown. The major objectives in management are controlling erosion and improving fertility and tilth. Crop residue left on the soil surface helps conserve moisture and improve tilth. Terracing and contour farming help control erosion.

This soil is well suited to pasture, mainly improved bermudagrass, kleingrass, weeping lovegrass, switchgrass, vetch, and arrowleaf clover. Fertilizer needs to be added to maintain production.

This soil is also used as rangeland, mainly a prairie plant community. Mesquite increases in areas of prolonged abuse by grazing animals.

This soil has fair potential for use as habitat for wildlife. Small, upland game birds and rabbits inhabit areas of this soil. Several of the forbs and grasses provide seed for food. Lack of woody vegetation limits use.

This soil is only moderately suited to most urban uses because of shrinking and swelling resulting from changes in moisture content, corrosivity to uncoated steel, and slow permeability. These limitations can be partly overcome by good design and proper installation of urban structures.

This soil is moderately suited to recreational uses. The clay loam surface layer and slow permeability are limitations. Loamy fill material and good grass cover help overcome these limitations.

This Ponder soil is in capability subclass IIIe and in the Clay Loam range site.

Ps—Pulexas very fine sandy loam, occasionally flooded. This soil is deep and nearly level. It is on flood plains and is subject to flooding for short periods about once every 3 to 25 years. The mapped areas are longer than they are wide and range from 12 to about 400 acres. Slope generally is 0 to 1 percent, but in some areas, it is as much as 2 percent.

Typically, this soil has a neutral, light yellowish brown very fine sandy loam surface layer about 7 inches thick.

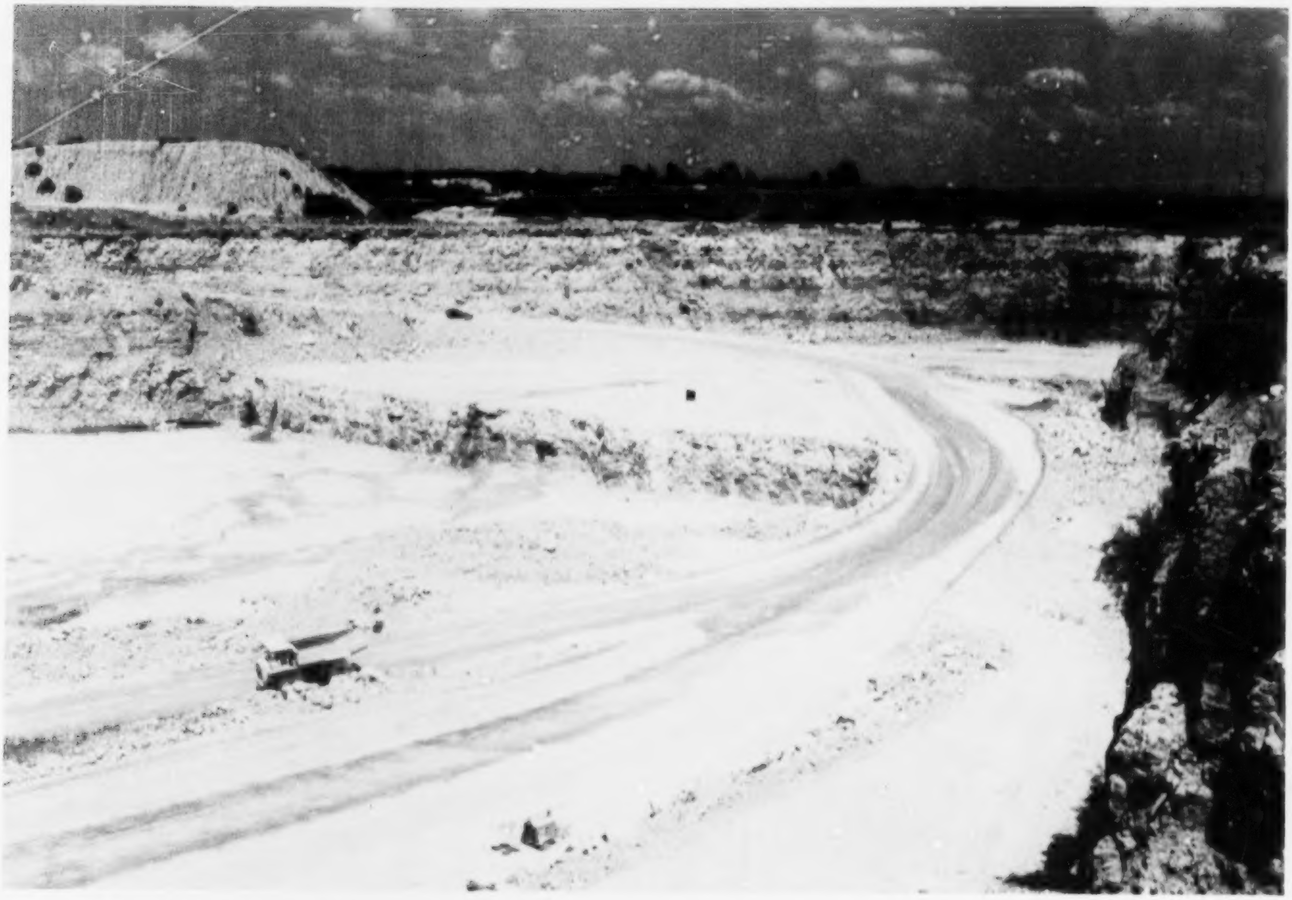


Figure 17.—Limestone is quarried for crushing from this area of Pits, quarries. Piled overburden that was removed to get to the limestone is in the background.

The layer below that to a depth of 61 inches is neutral, light yellowish brown and brown very fine sandy loam that has thin strata of loam. A buried surface layer of neutral, brown loam extends to a depth of 72 inches.

This soil is well drained. Permeability is moderately rapid, and the available water capacity is moderate. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is severe. This soil is easy to work throughout a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are small areas of Balsora soils and soils similar to the Pulexas soil but are calcareous throughout. A few areas of Pulexas soils that are subject to frequent flooding are in lower positions on the landscape. Because of flooding, some areas have various amounts of other loamy surface textures. The included soils make up 5 to 20 percent of the map unit.

This Pulexas soil is used mainly as cropland. It is well suited to peanuts (fig. 18), small grains, melons, fruit orchards, vineyards, and hay. Management objectives include controlling soil blowing, conserving soil moisture, and maintaining tilth and fertility. Crop residue left on the surface helps to control wind erosion, conserve soil moisture, and maintain soil tilth. Cool-season legumes, such as vetch and winter peas, help control soil blowing and maintain tilth and fertility.

This soil is well suited to pasture, mainly improved bermudagrass, kleingrass, weeping lovegrass, arrowleaf clover, and singletary peas.

This soil is also used as rangeland. Mid and tall grasses and an overstory of pecan, elm, hackberry, oak, and willow are common in most areas.

This soil has good potential for use as habitat for wildlife. Furbearers, deer, squirrel, turkey, dove, and quail

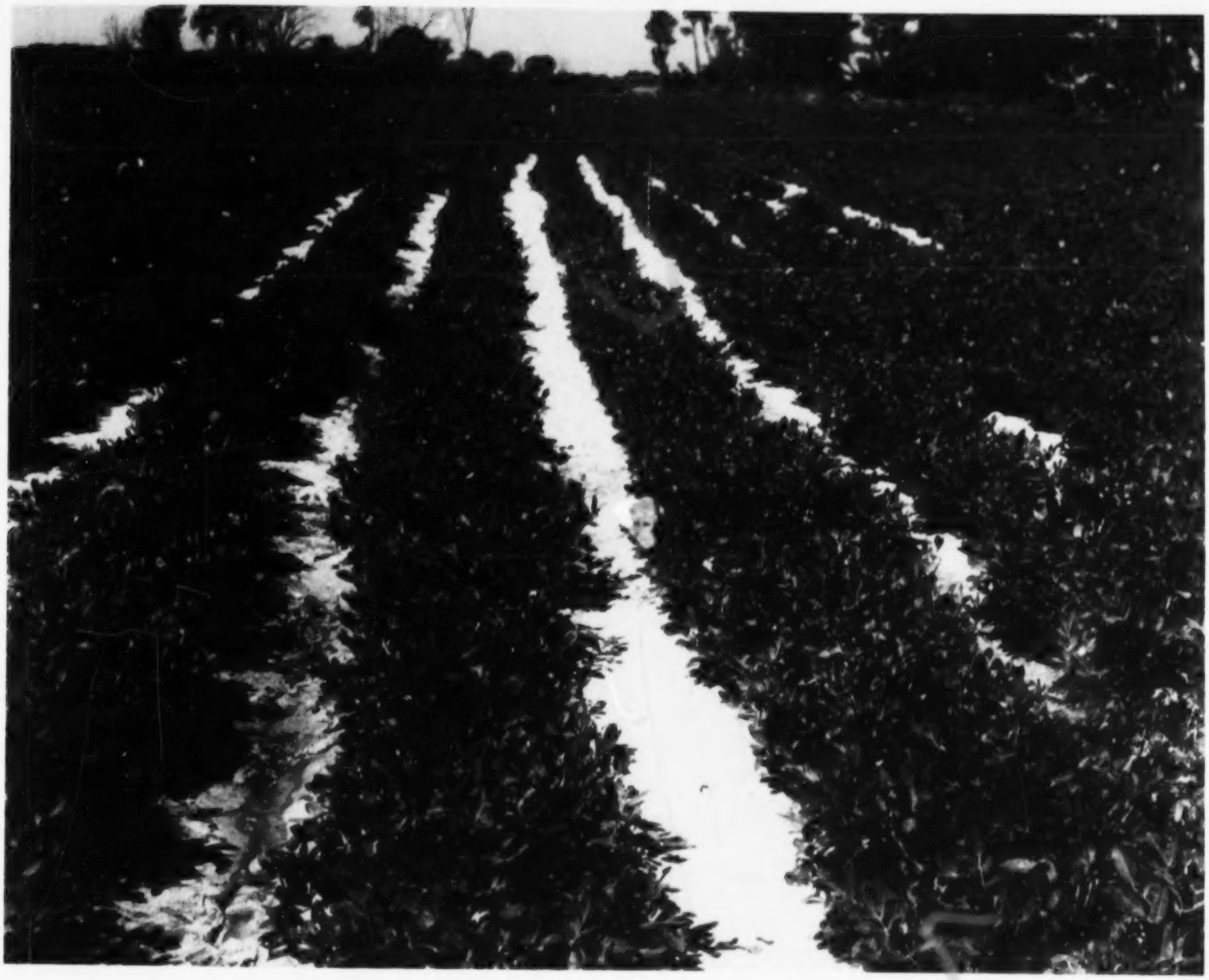


Figure 18.—Peanuts grow well on Pulexas very fine sandy loam, occasionally flooded.

inhabit areas of this soil. Several of the woody plants, forbs, and grasses provide good cover, browse, mast, and seeds for game birds and animals.

Because of flooding, this soil is poorly suited to urban uses. In areas where flooding can be totally controlled, the soil is well suited. Recreational uses on this soil are limited only by flooding.

This Pulexas soil is in capability subclass IIw and in the Loamy Bottomland range site.

Pu—Pulexas soils, frequently flooded. These soils are deep and nearly level. They are on flood plains and are subject to flooding for very brief to brief periods about 5 to 7 times every 10 years. The surface layer is mainly very fine sandy loam, but because new sediment is deposited from each flood, fine sandy loam, loamy fine sand, loam, or clay loam is in some areas. The mapped areas are long and narrow and commonly occupy the entire flood plain of the smaller streams. Slope generally is 0 to 1 percent, but in minor parts of some areas, it is as much as 2 percent.

Typically, these soils have a neutral, light yellowish brown very fine sandy loam surface layer about 8 inches thick. The layer below that to a depth of 70 inches is mildly alkaline, brownish very fine sandy loam that has common bedding planes and thin strata of coarser and finer material. A buried surface layer of mildly alkaline, brown very fine sandy loam extends to a depth of 80 inches.

Pulexas soils are well drained. Permeability is moderately rapid, and the available water capacity is moderate. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is severe in unprotected areas. The root zone is deep and is easily penetrated by plant roots.

Included with these soils in mapping are small areas of Balsora soils along the outer edge of the flood plain and a soil similar to the Pulexas soils but is calcareous throughout. A similar soil that has a dark-colored silty clay or silty clay loam layer below a depth of 35 inches is in some areas. The included soils make up less than 20 percent of the map unit.

The Pulexas soils are used mainly as pasture and are well suited to this use. Suitable pasture plants include improved bermudagrass, weeping lovegrass, kleingrass, switchgrass, arrowleaf clover, vetch, and singletary peas. Pecan trees are commonly managed with the pasture.

These soils are poorly suited to use as cropland because of the hazard of frequent flooding. Because of the high yield potential of these soils, a few areas are cultivated to forage sorghums.

The Pulexas soils are well suited to use as rangeland. Well managed rangeland has mid and tall grasses and a scattering of pecan, elm, oak, hackberry, and boxelder.

These soils have fair potential for use as habitat for wildlife. Deer, turkey, squirrel, dove, quail, and furbearers inhabit areas of these soils. Turkeys commonly use the large trees for roosting. Many choice plants for deer and turkey are produced, and excellent resting and nesting places and escape cover are also provided.

These soils are poorly suited to urban and recreational uses because of the hazard of flooding.

The Pulexas soils are in capability subclass Vw and in the Loamy Bottomland range site.

PvB—Purves clay, 1 to 3 percent slopes. This soil is shallow and gently sloping. It is on uplands. The mapped areas are elongated to oval and range from 8 to about 90 acres.

Typically, this soil has a moderately alkaline, very dark gray clay surface layer 12 inches thick. The next layer to a depth of 15 inches is moderately alkaline, very dark grayish brown very gravelly clay. It is underlain by fractured limestone interbedded with clayey marl.

This soil is well drained. Permeability is moderately slow, and the available water capacity is very low. Surface runoff is slow to medium, and the hazard of water erosion is moderate. This soil has good tilth and can be easily worked, but deep plowing often brings up pieces of limestone. The root zone is restricted by rock at a shallow depth, but some roots penetrate deep into the fractures.

Included with this soil in mapping are small areas of Aledo and Somervell soils, a soil similar to the Purves soil but that is less than 8 inches deep to fractured limestone, and another clayey soil that is noncalcareous but otherwise is similar to the Purves soil. The included soils make up less than 25 percent of the map unit.

This Purves soil is used mainly as cropland. Small grains are grown in most cultivated areas and provide winter grazing as well as hay or grain.

This soil is only moderately suited to use as cropland because of the very low available water capacity. It is better suited to crops that grow during the cool season than to summer crops. Crop residue left on the surface helps control erosion, conserve moisture, and improve tilth. Cool-season legumes in rotation with small grains further help to control erosion and maintain soil tilth.

This soil is only moderately suited to use as pasture because droughtiness limits production. Improved bermudagrass and kleingrass are commonly grown. Pasture management objectives include fertilization, weed control, and controlled grazing.

Many areas of this soil are used as rangeland. The native climax vegetation is a true prairie of mid and tall grasses.

This soil has fair potential for use as habitat for wildlife. Dove and quail inhabit areas of this soil. Lack of woody cover limits wildlife use. Cultivated fields provide grain and seeds for wildlife.

This soil is only moderately suited to most urban uses because of the depth to limestone, shrinking and swelling with changes in moisture content, corrosivity to uncoated steel, and the moderately slow permeability. In most areas, the limestone bedrock can be excavated without the use of explosives. Most limitations can be overcome by good design and proper installation of urban structures.

The soil is poorly suited to most recreational uses. The clay surface that is sticky when wet and cracks when dry and the shallow depth to limestone are the main limitations.

This Purves soil is in capability subclass IIIe and in the Shallow range site.

SaB—Sanger clay, 1 to 3 percent slopes. This soil is deep and gently sloping. It is on uplands. The mapped areas are irregularly shaped to oblong and range from about 8 to 60 acres. Untilled areas have gilgai microrelief.

Typically, this soil has a moderately alkaline, dark grayish brown clay surface layer about 8 inches thick. The layer below that extends to a depth of 62 inches. It is moderately alkaline clay that is very dark grayish brown in the upper part, grayish brown in the middle part, and light olive brown in the lower part. The underlying material to a depth of 70 inches is moderately alkaline, light olive brown and light olive gray shaly clay.

This soil is well drained. Permeability is very slow, and the available water capacity is high. Runoff is medium, and the hazard of water erosion is moderate. When this soil is dry, deep, wide cracks form. Water enters the soil rapidly when the soil is cracked. When the soil is wet, the cracks are sealed and water enters the soil very slowly. This soil is difficult to work at extremes in moisture content. The high content of calcium carbonate causes iron chlorosis in sensitive plants. The root zone is deep, but plant root penetration through the clayey layers is slow.

Included with this soil in mapping are small areas of San Saba and Slidell soils along drainageways. The included soils make up to 20 percent of the map unit.

This Sanger soil is used mainly as cropland and is well suited to this use. Common crops are grain sorghum (fig. 19), small grains, and hay. The main objectives in management are controlling erosion and maintaining tilth. Terracing and contour farming are needed to slow runoff and control erosion. Deep-rooted legumes and crop residue left on or near the soil surface help control erosion and maintain tilth.

This soil is well suited to pasture, mainly improved bermudagrass, indiangrass, switchgrass, johnsongrass, kleingrass, vetch, and sweetclover. Pasture management objectives include fertilization, weed control, and controlled grazing.

The potential for use as habitat for dove, quail, and songbirds is good. Sparse woody plants provide little protective cover for deer. Excessive grazing further reduces wildlife food and cover plants.

This Sanger soil is only moderately suited to most urban uses because of shrinking and swelling resulting from changes in moisture content and the corrosivity to uncoated steel. These limitations can only be partly overcome by good design and proper installation of urban structures. This soil is poorly suited to septic tank systems because of the very slow permeability. Increasing the size of the absorption field can help overcome this limitation.

This soil is poorly suited to most recreational uses. The main limitations are the very slow permeability and the clay surface layer, which has deep, wide cracks when dry and is sticky when wet.

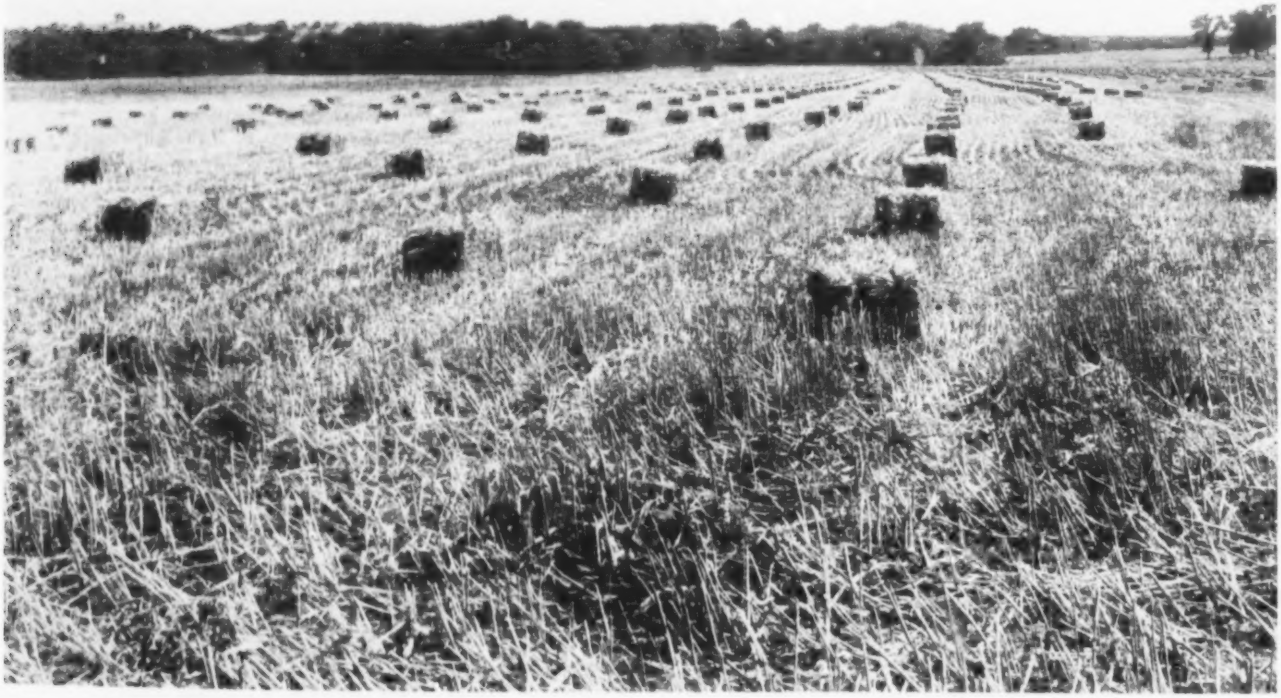


Figure 19.—Forage sorghum is grown for hay on many acres of Sanger clay, 1 to 3 percent slopes.

This Sanger soil is in capability subclass IIe and in the Blackland range site.

SaC—Sanger clay, 3 to 5 percent slopes. This soil is deep and gently sloping. It is on valley hillsides. The mapped areas are longer than they are wide and range from about 10 to 130 acres. Untilled areas have gilgai microrelief. The microridges and microvalleys are parallel and are oriented up and down the slope.

Typically, this soil has a moderately alkaline, very dark grayish brown and dark grayish brown clay surface layer about 24 inches thick. The underlying material to a depth of 70 inches is moderately alkaline clay. The upper part is grayish brown, and the lower part is light olive brown with mottles in shades of yellow.

This soil is well drained. Permeability is very slow, and the available water capacity is high. Runoff is medium, and the hazard of water erosion is moderate. Deep, wide cracks form when this soil is dry. Water enters the soil rapidly when the soil is cracked. When the soil is wet, the cracks are sealed and water enters the soil very slowly. This soil is difficult to work at extremes in moisture content. The high content of calcium carbonate causes iron chlorosis in sensitive plants. The root zone is deep, but root penetration through the clayey layers is slow.

Included with this soil in mapping are small bands of Bolar and Medlin soils on upper parts of the slope and San Saba soils near the head of drainageways. These closely similar soils make up as much as 20 percent of the map unit.

This Sanger soil is well suited to use as cropland. It is used for grain sorghum, small grains, and hay but is limited by slope. The main objectives in management are controlling erosion and maintaining tilth. Terracing and contour farming are needed to slow runoff and control erosion. Deep-rooted legumes and crop residue left on or near the soil surface help control erosion and maintain tilth.

This soil is well suited to pasture, mainly improved bermudagrass, indiangrass, switchgrass, johnsongrass, kleingrass, vetch, and sweetclover. Pasture management objectives include fertilization, weed control, and controlled grazing.

Many areas of this soil are used as rangeland. The native mid and tall grasses are excellent forage. Woody vegetation is mainly limited to a few elm and hackberry trees along drainageways and fence rows.

This soil has fair potential for use as habitat for wildlife. Small, upland game birds inhabit areas of this soil. Several of the grasses and forbs provide excellent seed and cover. Crop residue provides additional food. Sparse woody plants provide little protective cover for wildlife.

This soil is only moderately suited to most urban uses because of shrinking and swelling with changes in moisture content, corrosivity to uncoated steel, and very slow permeability. These limitations can only be partly overcome by good design and proper installation of urban structures.

This soil is poorly suited to most recreational uses. The main limitations are the very slow permeability and the clay surface layer, which has cracks when dry and is sticky when wet.

This Sanger soil is in capability subclass IIIe and in the Blackland range site.

SaD—Sanger clay, 5 to 8 percent slopes. This soil is deep and sloping. It is on side slopes of ridges. The mapped areas are oblong or long and narrow and follow the contour of the slope. They range from 7 to more than 200 acres.

In a microvalley, this soil typically has a moderately alkaline, dark grayish brown clay surface layer about 10 inches thick. The layer below that to a depth of 29 inches is moderately alkaline, dark grayish brown clay. The next layer to a depth of 50 inches is moderately alkaline, light yellowish brown clay that has olive brown mottles and soft masses and concretions of calcium carbonate. The underlying material to a depth of 60 inches is moderately alkaline, brownish and yellowish shaly clay that has soft masses of calcium carbonate.

This soil is well drained. Permeability is very slow, and the available water capacity is high. Deep, wide cracks form when the soil is dry. Water enters the soil rapidly when the soil is cracked. When the soil is wet, the cracks are sealed and water enters the soil very slowly. Runoff is rapid, and the hazard of erosion is severe. The root zone is deep, but root penetration through the clayey layers is slow.

Included with this soil in mapping are narrow bands of Bolar, Purves, and San Saba soils on narrow ridgetops and on side slopes above areas of limestone bedrock. Also included are small areas of Medlin soils on upper slopes and in eroded areas and a few narrow bands of Sanger soils that have slope of as much as 10 percent. The included soils make up to 25 percent of the map unit.

This Sanger soil is used mainly as rangeland, but a few minor areas are cultivated. The climax vegetation is a tall and mid grass prairie that has a few elm and hackberry trees along drainageways.

This soil has fair potential for use as habitat for dove, quail, and songbirds. Sparse woody plants provide little protective cover. Excessive grazing further reduces wildlife food and cover plants.

This soil is poorly suited to use as cropland. The few areas that are cultivated are used for small grains and forage sorghums. The rapid runoff that causes a severe erosion hazard is the main limitation. Terraces, contour farming, and close-spaced crops help to control erosion. Crop residue left on the surface helps to conserve moisture, reduce soil temperature, and maintain productivity.

This soil is well suited to pasture, mainly improved bermudagrass, switchgrass, kleingrass, sweetclover, vetch, and old world bluestem.

This soil is poorly suited to urban uses because of steepness of slope, the severe hazard of water erosion, shrinking and swelling resulting from changes in moisture content, very slow permeability, and corrosivity to uncoated steel. Soil slippage is likely where deep cuts are made across the slope.

This soil is poorly suited to most recreational uses because of the clay surface layer, steepness of slope, and very slow permeability.

This Sanger soil is in capability subclass IVe and in the Blackland range site.

SbB—San Saba clay, 1 to 3 percent slopes. This soil is moderately deep and gently sloping. It is at the head of natural drainageways or on interstream divides. The mapped areas are subrounded and range from 5 to about 75 acres. Slope averages about 1.5 percent.

Typically, this soil has a moderately alkaline, dark gray clay surface layer about 11 inches thick. The next layer to a depth of 30 inches is moderately alkaline, very dark gray clay. It is underlain by indurated fractured limestone bedrock.

This soil is moderately well drained. Permeability is very slow, and the available water capacity is low. Runoff is slow, and the hazard of erosion is slight. This soil has wide cracks when it is dry and is difficult to work at extremes in moisture content. The root zone is moderately deep, but penetration by plant roots is slow.

Included with this soil in mapping are small spots of Purves soils near the outer edge of delineations and, at lower elevations, soils that have bedrock at a depth of more than 40 inches but otherwise are similar to San Saba soil. Some San Saba soils that have slope of less than 1 percent are also included. The included soils make up as much as 15 percent of the map unit.

This San Saba soil is used mainly as cropland. It is well suited to grain sorghum, forage sorghum, and small grains (fig. 20). The low available water capacity limits the yield of summer-grown crops. Close-spaced crops and crops that produce large amounts of residue help to control erosion and maintain tilth. Deep-rooted legumes help aerate the soil and improve fertility.

This soil is well suited to pasture, mainly improved bermudagrass, indiangrass, switchgrass, kleingrass, sweetclover, and vetch. Fertilizer, weed control, and controlled grazing are needed.

Many areas of this San Saba soil are used as rangeland. The native vegetation is a mid and tall grass prairie. Woody vegetation is mainly along fence rows.

This soil has fair potential for use as habitat for wildlife. Dove, quail, and small mammals inhabit areas of this soil. Several of the forbs and grasses provide excellent food and cover for game birds and animals. Crop residue provides additional food. Excessive grazing reduces yearlong food and cover for wildlife.

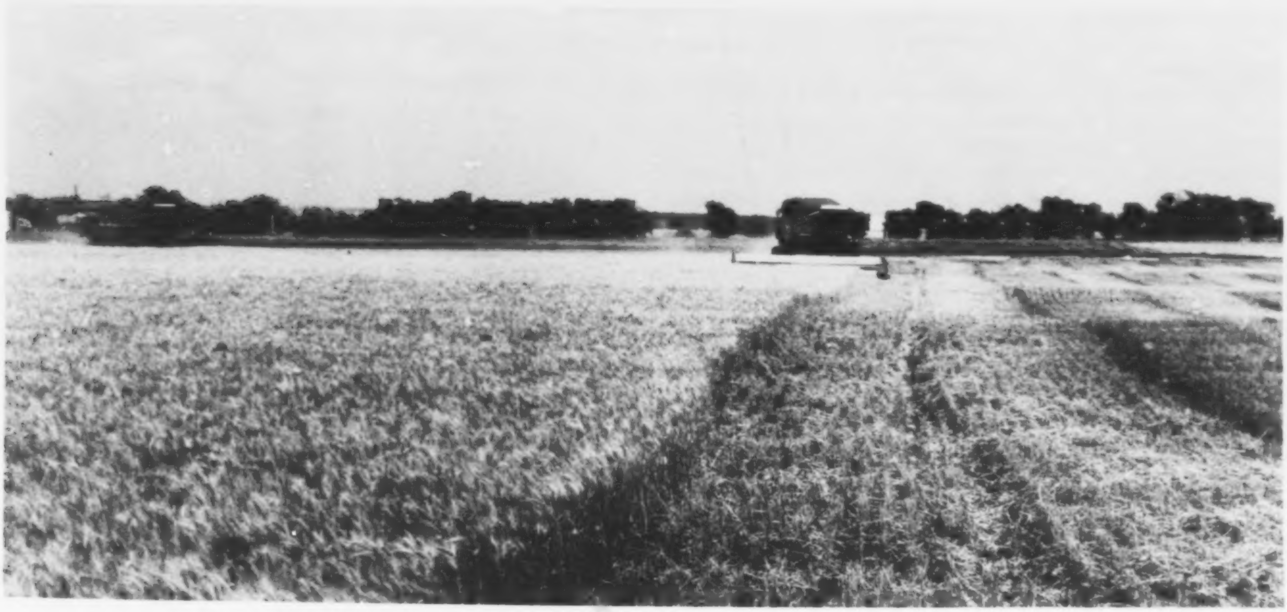


Figure 20.—Wheat is one of the main crops grown on San Saba clay, 1 to 3 percent slopes.

This soil is only moderately suited to most urban uses because of the shrinking and swelling resulting from changes in moisture content, depth to bedrock, very slow permeability, and corrosivity to uncoated steel. Good design and proper installation of urban structures can partly overcome these limitations.

This soil is poorly suited to most recreational uses. The main limitations are depth to bedrock, very slow permeability, and the clay surface layer that has deep, wide cracks when dry and is sticky when wet.

This San Saba soil is in capability subclass IIIe and in the Blackland range site.

SdB—Selden loamy fine sand, 1 to 3 percent slopes. This soil is deep and gently sloping. It is on uplands. The mapped areas are irregularly shaped to oval and range from 7 to about 120 acres. Slope is concave and averages about 1.5 percent.

Typically, this soil has a neutral loamy fine sand surface layer about 13 inches thick. It is light yellowish brown in the upper part and very pale brown in the lower part. The subsoil to a depth of 70 inches is sandy clay loam. It is brownish yellow in the upper part and mottled in shades of yellow, red, brown, and gray in the lower part. The subsoil is slightly acid in the upper part grading to strongly acid in the lower part.

This soil is moderately well drained. Permeability is moderately slow, and the available water capacity is moderate. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is severe in areas that are bare of vegetation. The root zone is deep, and roots can easily penetrate the lower layers. This soil is easy to work throughout a wide range of moisture content.

Included with this soil in mapping are scattered areas of Chaney soils, which are closely similar to the Selden soil and make up as much as 35 percent of some mapped areas, and some areas of Hassee soils in small spots in depressions. Some wind-eroded areas of Nimrod and Selden soils are also included. Some of the Selden soils have a fine sand surface layer, and others have almost all of the surface layer removed by wind erosion. Also included are a few deeply gullied areas that are as much as 4 acres in size.

This Selden soil is used mainly as pasture. It is well suited to improved bermudagrass, weeping lovegrass, switchgrass, vetch, and arrowleaf clover. Fertilizing at planned intervals, weed control, and controlled grazing are management objectives. Emerging grass seedlings need to be protected from blowing sand.

This soil is well suited to use as cropland; however, low natural fertility and the droughty surface layer are limitations for production. Small grains, forage sorghums, peanuts, melons, and truck crops are commonly grown. Soil blowing can be controlled by leaving crop residue on the soil surface, growing cool-season legumes (fig. 21), or planting strips of tall-growing forages. Terraces, contour farming, and grassed waterways are needed to control water erosion.

Many areas of this soil are used as rangeland. The better managed areas have mid and tall grasses and a scattering of trees and brush. In most areas, prolonged grazing has caused brush to thicken.

This soil has good potential for use as habitat for wildlife. Deer, turkey, dove, quail, and squirrel feed on acorns and other mast. If brush is dense, habitat for most wildlife declines, although deer use the brush for escape and resting cover. Turkeys use the tall grasses for nesting.

This Selden soil is well suited to most urban uses. The main limitations are seasonal wetness in the lower part of the subsoil and corrosivity to uncoated steel. The moderately slow permeability is a limitation for septic tank absorption fields. These limitations can be easily overcome by good design and proper installation of urban structures.

This soil is only moderately suited to recreational uses because the loamy fine sand surface layer blows when unprotected. Maintaining a good grass cover or using loamy fill material helps to prevent soil blowing.

This Selden soil is in capability subclass IIIe and in the Loamy Sand range site.

SeE—Set very stony silty clay, 8 to 30 percent slopes. This soil is deep. It is on strongly sloping to steep hillsides below limestone escarpments. The mapped areas are long and narrow to oblong and range from 15 to 70 acres. Slope is concave and receives extra runoff moisture.

Typically, this soil has a moderately alkaline, dark grayish brown very stony silty clay surface layer about 11 inches thick. About 8 percent of the surface is covered with limestone fragments that are 10 to 40 inches across and 3 to 8 inches thick. The subsoil to a depth of 54 inches is moderately alkaline silty clay loam that has concretions and soft masses of calcium carbonate. It is pale brown in the upper part and light yellowish brown in the lower part. The underlying material to a depth of 64 inches is moderately alkaline, pale olive shaly clay that has mottles and streaks of light gray.

This soil is well drained. Permeability is slow, and the available water capacity is high. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is slight. The root zone is deep, and plant roots can easily penetrate the friable lower layers. The high content of calcium carbonate restricts some plants.

Included with this soil in mapping are Palopinto soils underlain by narrow bands of limestone, Owens soils underlain by shaly material on upper slopes, and soils similar to the Set soil but are less than 40 inches deep. These soils make up 15 to 30 percent of some mapped areas. Also included are small areas of vertical limestone cliffs and large boulders on the upper edge of the escarpment and a few areas of non-stony Set soils. These inclusions make up about 10 percent of some mapped areas.

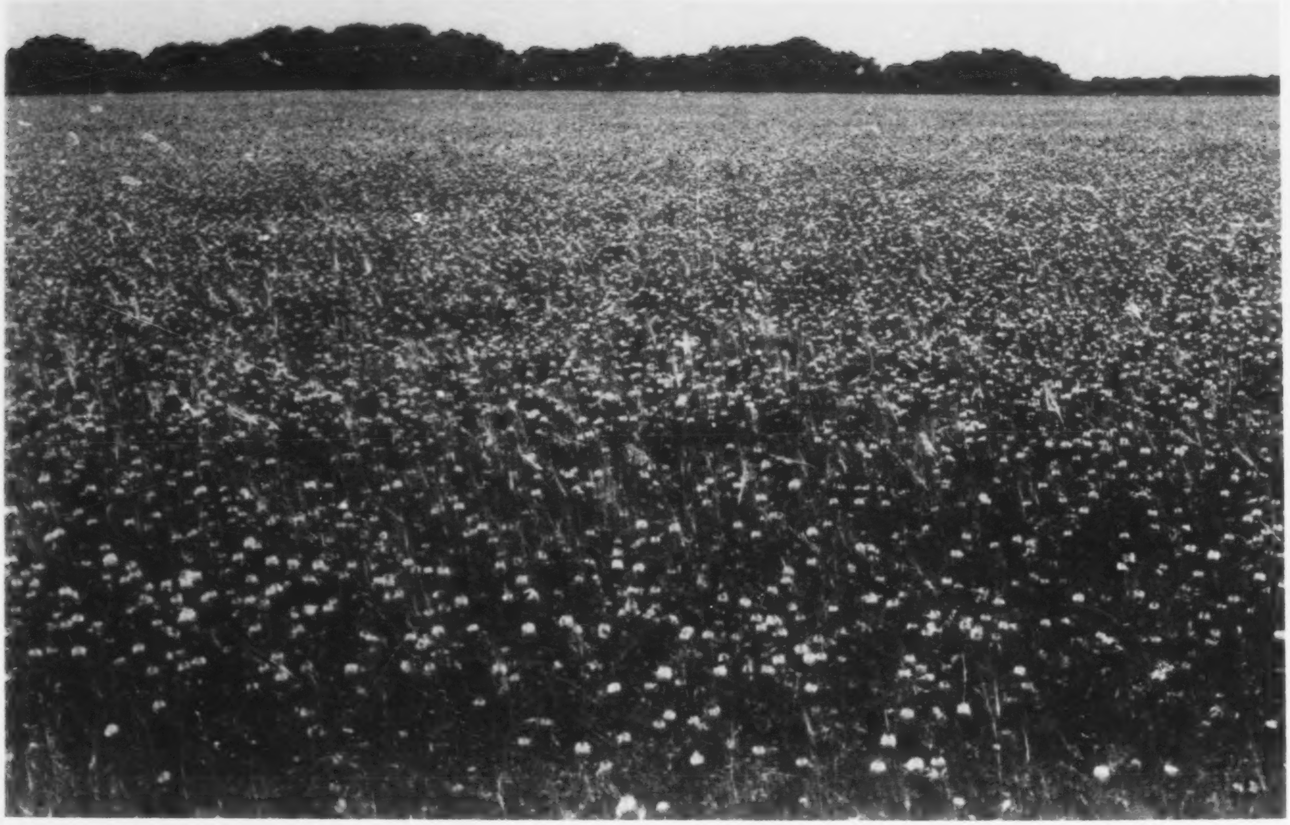


Figure 21.—Arrowleaf clover grows well on Selden loamy fine sand, 1 to 3 percent slopes. This annual legume is commonly overseeded in bermudagrass for cool-season grazing and nitrogen fixation. This also helps to control wind erosion.

This Set soil is used mainly as rangeland and habitat for wildlife. In most areas, the native vegetation of mid and tall grasses has been replaced by a thick overstory of oaks, mesquite, ash (fig. 22), and cedar elm. The steep slopes adversely affect livestock accessibility and mechanical brush control.

This soil has fair potential for use as habitat for wildlife. Deer, turkey, dove, and quail inhabit areas of this soil. Cover is adequate. Browse plants, forbs, and grasses furnish a year-round food supply.

This soil is poorly suited to crops, pasture, and urban and recreational uses. Steepness of slope, stoniness, and the shrink-swell potential are the main limitations.

The Set soil is in capability subclass VIIs and in the Clay Loam Slope range site.

SfC—Silawa fine sandy loam, 3 to 8 percent slopes. This soil is deep. It is on gently sloping and sloping side slopes above flood plains. The mapped areas are elongated or oblong and range from 6 to about 80 acres. Slope is convex and averages about 6 percent.

Typically, this soil has a slightly acid fine sandy loam surface layer about 12 inches thick. This layer is brown in the upper part and light yellowish brown in the lower part. The subsoil to a depth of 46 inches is sandy clay loam. It is medium acid and red in the upper part and slightly acid and yellowish red in the lower part. The lower part of the subsoil to a depth of 59 inches is slightly acid, reddish yellow fine sandy loam. The underlying material to a depth of 80 inches is neutral, reddish yellow fine sandy loam.

This soil is well drained. Permeability is moderate, and the available water capacity is moderate. Runoff is medium. The hazards of water erosion and soil blowing are severe if the soil is left bare of vegetation. The root zone is deep, and the loamy subsoil is easily penetrated by plant roots. In some areas along major streams, this

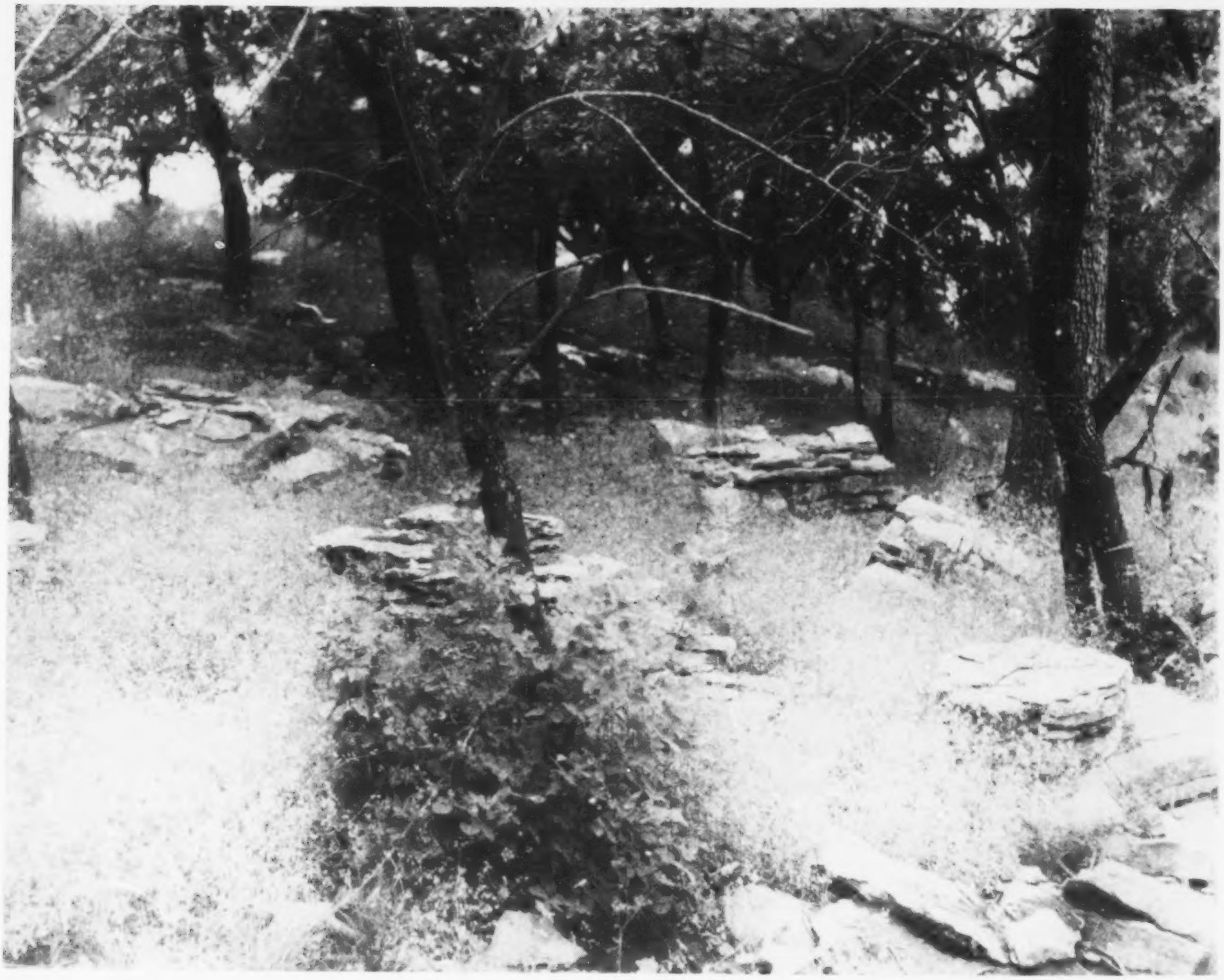


Figure 22.—Texas ash is common in rangeland areas of Set very stony silty clay, 8 to 30 percent slopes.

soil is underlain by material that has various amounts of sand and gravel.

Included with this soil in mapping are small areas of Heaton soils on foot slopes. Also included are a few areas of deep gullies, a few areas of soils that have slope of as much as 10 percent, and some Silawa soils that have a loamy fine sand surface layer. The included soils make up less than 20 percent of the map unit.

This Silawa soil is used mainly as pasture. It is well suited to improved bermudagrass, weeping lovegrass, kleingrass, switchgrass, old world bluestem, vetch, and arrowleaf clover. Pasture management objectives include fertilization, weed control, and controlled grazing.

This soil is moderately suited to use as cropland. Because of the hazard of erosion, it is best suited to close-spaced crops. Crop residue left on the surface helps to conserve moisture, lower soil temperature, maintain tilth and productivity, and control erosion. Terracing and contour farming are needed to control water erosion.

This Silawa soil is also used as rangeland. Well managed areas have mid and tall grasses and a scattering of oak and elm trees.

This soil has good potential for use as habitat for wildlife. Deer, dove, quail, turkey, and squirrel inhabit reas of this soil. Several of the woody plants, forbs, and rasses provide good cover, browse, mast, and seeds or game birds and animals.

This soil is well suited to most urban uses. In some of he more sloping areas, sewage effluent can seep to the urface.

This soil is only moderately suited to most recreational ses because of the steepness of slope and the hazard f erosion.

This Silawa soil is in capability subclass IVe and in the Sandy Loam range site.

SfC3—Silawa fine sandy loam, 3 to 8 percent lopes, eroded. This soil is deep and gently sloping. It s on uplands above adjacent flood plains. Most areas of his soil have a few shallow gullies and an occasional leep gully. In 10 to 30 percent of most areas, erosion as washed away the topsoil and exposed the reddish ubsoil. The mapped areas are oblong to irregularly haped and average about 25 acres.

Typically, this soil has a slightly acid, light yellowish rown fine sandy loam surface layer about 6 inches hick. The subsoil to a depth of 46 inches is sandy clay oam. It is slightly acid and red in the upper part, medium cid and yellowish red in the middle part, and slightly cid and reddish yellow in the lower part. The underlying naterial to a depth of 60 inches is slightly acid, red ravelly fine sandy loam.

This soil is well drained. Permeability is moderate, and he available water capacity is moderate. Because of the roded surface, runoff is rapid and the hazard of water rosion is severe. The hazard of soil blowing is severe if he soil is left bare of vegetation. The rapid runoff and he thin or absent surface layer causes the soil to be roughty. Plant establishment is difficult. The root zone is eep, and roots of established plants penetrate the ower layers. In some areas, this soil is underlain by arious amounts of sand and gravel.

Included with this soil in mapping are small areas of losely similar Heaton soils on foot slopes and Vindthorst soils on eroded upper slopes. Also included re Silawa soils that have a loamy fine sand surface ayer and Silawa soils that are not eroded. The included oils make up to 25 percent of the map unit.

This Silawa soil is used mainly as pasture. It is noderately suited to improved bermudagrass, witchgrass, weeping lovegrass, vetch, and arrowleaf lover. In some areas, gully control and shaping are eeded before pasture establishment. Extra amounts of ertilizer are commonly needed to help overcome low ertility and droughtiness caused by erosion.

This soil is only moderately suited to use as cropland ecause of erosion. In some areas, this soil is so everely eroded that it is not suited to use as cropland. ienerally, only small noneroded or slightly eroded areas re suitable for farming. If this soil is used for crops, stablishing close-growing crops and leaving crop residue on the surface are needed to control erosion. Terraces and grassed waterways can also help to control runoff and erosion.

Many areas of this soil are used as rangeland. This soil is suited to mid and tall grasses. Some abandoned cropland areas used as rangeland would benefit from brush control, shaping and controlling gullies, and reseeding.

This soil has good potential for use as habitat for wildlife. Dove and quail inhabit areas of this soil. Deer and turkey feed in areas of this soil and use cover on adjacent soils. Excessive grazing by livestock reduces food and cover and accelerates erosion.

This soil is well suited to most urban uses; however, the hazard of erosion is a limitation.

This soil is only moderately suited to most recreational uses because of steepness of slope and the severe hazard of erosion.

This Silawa soil is in capability subclass IVe and in the Sandy Loam range site.

SgA—Slidell clay, 0 to 1 percent slopes. This soil is deep and nearly level. It is on concave upland ridges and in areas along drainageways. Untilled areas have gilgai microrelief. The mapped areas are oval to elongated and range from 15 to about 40 acres.

Typically, this soil has a moderately alkaline, dark gray clay upper layer about 36 inches thick. The middle layer to a depth of 44 inches is moderately alkaline, grayish brown clay. The lower layer to a depth of 80 inches is moderately alkaline, light yellowish brown clay that has grayish brown and yellow mottles and common concretions and masses of calcium carbonate.

This soil is well drained. Permeability is very slow, and the available water capacity is high. Runoff is slow, and the hazard of erosion is slight. When this soil is dry, deep, wide cracks form. Water enters the cracks rapidly. When the soil is wet, the cracks seal and water enters the soil very slowly. This soil is difficult to work at extremes in moisture content. The root zone is deep, but penetration by plant roots is slow.

Included with this soil in mapping are small spots of San Saba soils and soils deeper to limestone than San Saba soils. The included soils make up about 10 percent of the map unit.

This Slidell soil is used mainly as cropland. It is well suited to grain sorghum and small grains. It is also suited to corn and cotton. The main objectives in management are maintaining tilth and fertility. Deep-rooted legumes and crops that produce a large amount of residue help to maintain tilth.

This soil is well suited to pasture, mainly improved bermudagrass, tall fescue, switchgrass, kleingrass, johnsongrass, vetch, and sweetclover. Pasture management objectives include fertilization, weed control, and controlled grazing.

This soil has good potential for use as habitat for wildlife. If adequate cover is nearby, areas of this soil that are used for grain and seed crops are especially suited to dove and quail.

This soil is only moderately suited to most urban uses because of shrinking and swelling resulting from changes in moisture content, corrosivity to uncoated steel, and very slow permeability. These limitations can only be partly overcome.

This soil is poorly suited to most recreational uses because of the very slow permeability and the clay surface layer that has deep, wide cracks when dry and is sticky when wet.

This Slidell soil is in capability subclass IIw and in the Blackland range site.

SgB—Slidell clay, 1 to 3 percent slopes. This soil is deep and gently sloping. It is in concave valley fill areas along drainageways. Untilled areas have gilgai microrelief. The microridges and microvalleys are parallel and are oriented up and down the slope. The mapped areas are oblong to elongated and range from 8 to 120 acres.

Typically, at the center of a microvalley, this Slidell soil has a moderately alkaline, dark gray clay plow layer about 9 inches thick. The layer below that to a depth of 50 inches is moderately alkaline clay that is very dark gray in the upper part and dark gray in the lower part. The next layer to a depth of 80 inches is moderately alkaline, dark grayish brown and grayish brown clay that has mottles in shades of brown and yellow and concretions and masses of calcium carbonate.

This soil is well drained. Permeability is very slow, and the available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate. Deep, wide cracks form when this soil is dry (fig. 23). Water enters the soil rapidly when the cracks are open. When the soil is wet, the cracks seal and water enters the soil very slowly. When the soil is worked dry, it clods, and when it is worked wet, dense plowpans form. The root zone is deep, but penetration by plant roots is slow.

Included with this soil in mapping are small areas of Sanger and San Saba soils. The included soils make up as much as 15 percent of the map unit.

This Slidell soil is used mainly as cropland, and it is well suited to this use. Grain sorghum and small grains are the main crops, but corn, cotton, and forage sorghum are also grown. The main objectives in management are controlling erosion and maintaining tilth. Terracing and contour farming slow runoff and help to control erosion. Deep-rooted legumes help maintain tilth. Crop residue left on or near the surface helps conserve moisture, slow runoff, and lower soil temperature.

This soil is well suited to pasture, mainly improved bermudagrass, kleingrass, johnsongrass, vetch, and sweetclover. Pasture management objectives include fertilization, weed control, and controlled grazing.

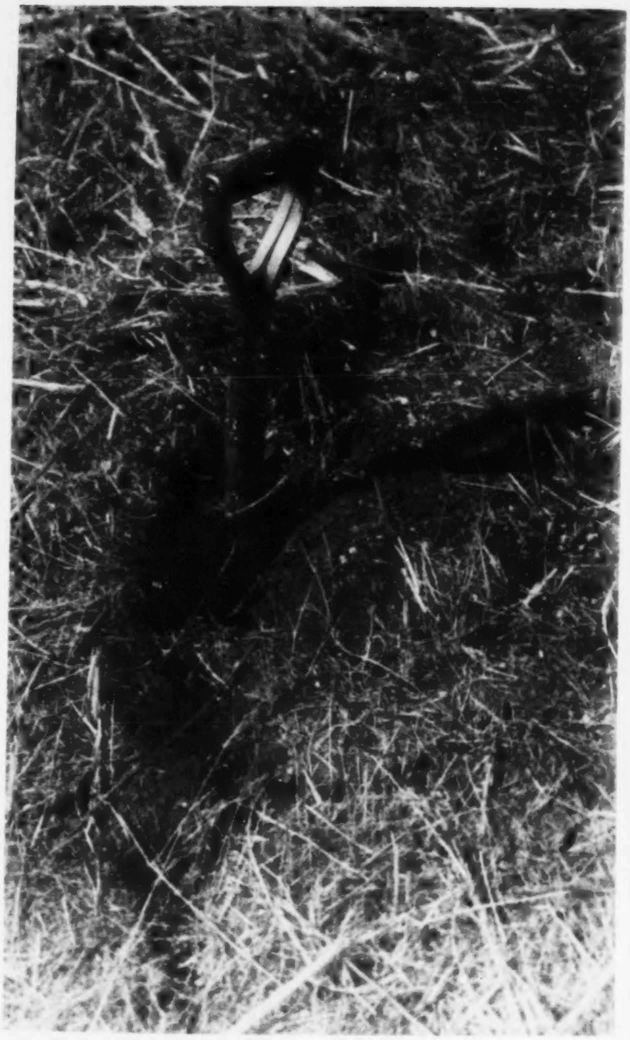


Figure 23.—Deep, wide cracks form in Slidell clay, 1 to 3 percent slopes, when this soil is dry. Cracking is typical in soils of the Vertisol order.

This soil is also used as rangeland. The native vegetation is a mixture of tall and mid grasses and a few scattered elm and hackberry trees along drainageways.

This soil has good potential for use as habitat for dove and quail, especially when grain and seed crops are grown nearby. Sparse woody plants provide little protective cover. Excessive grazing further reduces wildlife food and cover plants.

This soil is only moderately suited to most urban uses because of shrinking and swelling resulting from changes in moisture content and corrosivity to uncoated steel. Because of very slow permeability, this soil is poorly suited to septic tank absorption fields. The limitations for urban use can only be partly overcome.

This soil is poorly suited to recreational uses because of the very slow permeability and the clay surface layer that has cracks when dry and is sticky when wet.

This Slidell soil is in capability subclass IIe and in the Blackland range site.

SoC—Somervell-Aledo complex, 1 to 8 percent slopes. This complex consists of very shallow, shallow, and moderately deep soils. These soils are on gently sloping to sloping ridges on the highest part of the landscape. Thin to thick strata of limestone and the hardness of the limestone determine the depth that the soils in this complex have weathered. Cobble- and gravel-size fragments of limestone cover 2 to 5 percent of the surface. The mapped areas are subrounded to oblong and range from 10 to about 450 acres.

This complex is about 50 percent Somervell soil, 35 percent Aledo soil, and 15 percent other soils. The soils in this complex are too intricately mixed to be mapped separately at the selected scale. Aledo soil is on ridgetops, and Somervell soil is on ridges in slightly lower positions. Somervell soil is underlain by fractured limestone at a depth of 20 to 40 inches, and Aledo soil is underlain by fractured limestone at a depth of less than 20 inches.

Typically, the Somervell soil has a moderately alkaline, dark brown very gravelly loam surface layer about 10 inches thick. This layer is about 37 percent gravel and 5 percent cobbles. The subsoil is moderately alkaline, brown and light yellowish brown very gravelly loam to a depth of 37 inches. The upper part of the subsoil is about 50 percent shell and limestone fragments mostly less than 8 inches across the long axis, and the lower part is about 40 percent weathered limestone fragments and about 20 percent platy marly material. The underlying material to a depth of 45 inches is coarsely fractured limestone bedrock interbedded with layers of weakly cemented limestone and loamy and clayey marly material.

The Somervell soil is well drained. Permeability is moderate, and the available water capacity is low. Runoff is rapid, and the hazard of water erosion is severe. The root zone is moderately deep and is easily penetrated by plant roots.

Typically, the Aledo soil is about 18 inches thick to hard limestone bedrock. This soil is dark brown and moderately alkaline. To a depth of about 4 inches, it is gravelly loam that is about 20 percent gravel and 5 percent cobbles. The layer below that is very gravelly loam with about 65 percent shell and limestone fragments mostly less than 6 inches across the long axis. The hard limestone bedrock is coarsely fractured and interbedded with weakly cemented limestone and clayey marl.

The Aledo soil is well drained. Permeability is moderate, and the available water capacity is very low. Runoff is rapid, and the hazard of water erosion is severe. The root zone is very shallow and shallow and is easily penetrated by plant roots. Plant roots penetrate the fractures between the limestone.

Included in mapping are small areas of Brackett soils that appear at random in the map unit and Sanger soils that are near the head of drainageways. These soils make up less than 15 percent of the map unit. In a few areas, the closely similar Bolar soils make up about 20 percent of the map unit.

The soils in this complex are used mainly as rangeland. The depth to limestone limits forage production. The natural vegetation is a true prairie of tall and mid grasses and a few scattered elm and hackberry trees along seeps and drainageways.

These soils have poor potential for use as habitat for wildlife except where woody vegetation provides cover. Excessive grazing reduces food and cover plants.

These soils are poorly suited to pasture and crops. The limestone fragments, shallow soil, and high content of calcium carbonate that causes iron chlorosis in some plants are limitations. Some minor areas of this complex that have been cultivated now have a surface pavement of limestone gravel and cobbles.

The soils in this complex are only moderately suited to most urban uses because of depth to bedrock, corrosivity to uncoated steel, and seepage during the wet seasons. These limitations are difficult to overcome, and good design and planning of urban structures are needed. Areas where seepage occurs need to be avoided for construction. Lawns require additional topsoil and frequent watering. The high content of lime in these soils causes iron chlorosis in sensitive plants.

These soils are poorly suited to most recreational uses because of the depth to bedrock and small stones on the surface.

This complex is in capability subclass VIs. Somervell soil is in the Clay Loam range site, and Aledo soil is in the Shallow range site.

SpB—Speck clay loam, 0 to 2 percent slopes. This soil is shallow and is nearly level and gently sloping. It is on plane to slightly concave ridges. The mapped areas are subrounded and range from 10 to 40 acres.

Typically, this soil has a mildly alkaline, dark brown clay loam surface layer about 4 inches thick. The subsoil to a depth of 16 inches is mildly alkaline, dark reddish gray clay. The underlying material to a depth of 24 inches is fractured, indurated limestone bedrock. Soil material and roots are in the fractures.

This soil is well drained. Permeability is slow, and the available water capacity is very low. Surface runoff is medium, and the hazard of erosion is moderate. This soil is difficult to work because of the crust on the surface and the dense plowpan. The root zone is shallow, and penetration by plant roots is impeded by the underlying clayey layer.

Included with this soil in mapping are a few small areas of Aledo and Mingo soils. Also included are a few small areas of closely similar soils that have a clayey surface layer. The included soils make up about 5 to 15 percent of the map unit. Also included are soils that are shallower than typical Speck soils but otherwise are similar. These soils make up as much as 25 percent of some mapped areas.

This Speck soil is used mainly as cropland, and it is moderately suited to this use. The major crops are small grains, grain sorghum, and forage sorghum. The shallow root zone and the very low available moisture capacity limit production. Deep plowing often brings up fragments of limestone. This soil is better suited to crops that are grown during the cool seasons than to summer crops. The objectives in management are controlling erosion, conserving moisture, and improving soil tilth and fertility. Close-spaced crops that produce large amounts of residue and residue left on or near the surface help control erosion, improve tilth, and conserve moisture. Cool-season legumes improve tilth and fertility.

This soil is also used as rangeland. The native plant community is a true prairie of mid and tall grasses. Prolonged overgrazing causes pricklypear, annual weeds, and short grasses to increase.

This soil has fair potential for use as habitat for wildlife, especially when grain and seed crops are grown nearby. Dove and quail inhabit the areas of this soil. Excessive grazing reduces food and cover.

This soil is moderately suited to pasture, mainly kleingrass, old world bluestem, and sideoats grama. The shallow depth to bedrock limits production. Pasture management objectives include fertilization and controlled grazing.

This soil is only moderately suited to most urban uses because of the depth to bedrock. It is poorly suited to septic tank absorption systems.

This soil is only moderately suited to most recreational uses because of the depth to bedrock.

The Speck soil is in capability subclass IIIe and in the Redland range site.

ThB—Thurber clay loam, 1 to 3 percent slopes. This soil is deep and gently sloping. It is on broad, upland foot slopes. The mapped areas are irregularly shaped or oblong and range from 10 to 40 acres. Slope is slightly concave.

Typically, this soil has a slightly acid, brown clay loam surface layer about 6 inches thick. The subsoil to a depth of 16 inches is neutral, dark brown clay. To a depth of 42 inches it is moderately alkaline, light olive brown clay. The lower part of the subsoil to a depth of 52 inches is moderately alkaline, light yellowish brown clay loam that has common masses of calcium carbonate. The underlying material to a depth of 62 inches is moderately alkaline, light brownish gray clay loam that has olive yellow mottles and common fragments of shale.

This soil is moderately well drained. Permeability is very slow, and the available water capacity is high. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight. Soil tilth is poor. The surface layer is very hard and massive when dry. In cultivated areas, a thick crust forms on the surface after rainfall. The soil can be tilled easily within a narrow range of moisture content. The root zone is deep, but plant roots are restricted by the dense layers of clay.

Included with this soil in mapping are small areas of Hassee soils in depressions and small areas of Truce soils on convex ridges. Areas of the included soils are less than 5 acres and make up less than 15 percent of the map unit.

This Thurber soil is mostly used as rangeland. The better managed areas have mostly short and mid grasses. Because of overgrazing, mesquite trees, tasajillo, pricklypear, and annual weeds have increased.

This soil has fair potential for use as habitat for wildlife. Deer, dove, quail, and rabbit inhabit areas of this soil. Native forbs and grasses provide ample food for game birds. If adjacent cover is adequate, deer graze along drainageways. Small grains provide winter food for deer.

This Thurber soil is moderately suited to use as cropland. Small grains and forage sorghum are grown in some areas. The droughty nature of this soil limits production. Terraces, contour cultivation, and crop residue left on the surface help control erosion and maintain soil productivity and tilth.

This soil is moderately suited to pasture, mainly King Ranch bluestem and kleingrass.

This soil is poorly suited to most urban and recreational uses because of shrinking and swelling and very slow permeability. These limitations are difficult to overcome.

This Thurber soil is in capability subclass IIIe and in the Claypan Prairie range site.

Tr—Trinity clay, occasionally flooded. This soil is deep and nearly level. It is on flood plains of major streams. This soil is flooded once every 2 to 4 years; flooding lasts from several hours to as long as 1 week. The mapped areas are long and broad and parallel the stream channels. They range from 20 to about 1,500 acres. Slope is 0 to 1 percent.

Typically, this soil is moderately alkaline, dark gray and very dark gray clay to a depth of 80 inches. It has concretions of calcium carbonate.

This soil is somewhat poorly drained. Permeability is very slow, and the available water capacity is high.

Runoff is very slow, and the hazard of erosion is slight. Deep, wide cracks form when this soil is dry. The cracks swell shut when the soil is wet. Water ponds on the surface for a few hours following heavy rains. The root zone is deep, but penetration by plant roots into the clayey material is slow.

Included with this soil in mapping are small areas of Frio soils and areas of Trinity soils that have as much as 10 inches of dark grayish brown overwash. The included soils make up less than 20 percent of the map unit.

This Trinity soil is mainly used as pasture. It is well suited to improved bermudagrass, tall fescue, indiangrass, switchgrass, kleingrass, johnsongrass, sweetclover, and singletary peas. Fertilizer, weed control, and controlled grazing are needed.

A few small areas of this soil are used as rangeland. Most of these areas are wooded. Prolonged grazing abuse results in a dense canopy and often a thick underbrush.

This soil has fair potential for use as habitat for wildlife. Waterfowl, dove, quail, deer, squirrel, and furbearers inhabit areas of this soil. Many choice forage plants are produced. Small grains provide winter grazing for deer. Excellent resting, nesting, and escape cover is provided in the wooded areas. Shallow water areas can be developed for waterfowl.

This Trinity soil is well suited to use as cropland. It is used for forage sorghum for hay and grazing, small grains, and grain sorghum. Wetness early in spring and late in fall and an occasional overflow during the cropping season are the major limitations. Surface drainage is needed in some areas of this soil. Maintaining tilth and productivity are major concerns in management.

This soil is poorly suited to urban and recreational uses because of flooding. Wetness, very slow permeability, and the clay surface layer that has deep, wide cracks when dry and is sticky when wet are other limitations for urban and recreational uses.

This Trinity soil is in capability subclass IIw and in the Clayey Bottomland range site.

TuB—Truce fine sandy loam, 1 to 3 percent slopes. This soil is deep. It is on gently sloping upland ridges. The mapped areas are elongated and range from about 6 to 80 acres. Slope is convex and averages about 2 percent.

Typically, this soil has a neutral, brown fine sandy loam surface layer about 6 inches thick. The subsoil to a depth of 44 inches is clay. It is slightly acid and reddish brown in the upper part, neutral and brown in the middle part, and mildly alkaline and light brownish gray in the lower part. The underlying material to a depth of 50 inches is mildly alkaline, olive gray very shaly clay.

This soil is well drained. Permeability is slow, and the available water capacity is low. The surface layer is very hard and massive when the soil is dry. After rainfall, a thick crust forms on the surface as the soil dries. This crust seals the soil. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is moderate. The dense, clayey layers restrict water intake, which combined with the rapid runoff makes this soil droughty. The soil can be worked only within a narrow range of moisture content. The root zone is deep, but the clayey layers impede penetration by plant roots.

Included with this soil in mapping are small spots of Bonti soils, which are underlain by sandstone, and Hassee soils in depressions along drainageways. Areas of these soils are less than 5 acres. Also included in some areas are spots of stony Truce soils that are less than an acre. The included soils make up less than 15 percent of the map unit.

This Truce soil is mainly used as rangeland. The better managed areas have a mixture of short and mid grasses, forbs, and a few scattered post oak trees. Mesquite trees have invaded many abused areas.

This soil has good potential for use as habitat for wildlife. Quail and dove inhabit areas of this soil. Deer and turkey feed in these areas and use cover on adjacent soils. Small grains provide winter grazing.

This soil is moderately suited to small grains, forage sorghums, and cool-season legumes. Terraces and contour farming help to control water erosion. Crop residue left on or near the surface helps slow runoff, conserve moisture, reduce soil blowing, and lower soil temperature.

This soil is moderately suited to pasture plants, mainly improved species of bermudagrass, weeping lovegrass, kleingrass, vetch, and varieties of arrowleaf clover. Pasture management objectives include weed control, fertilization, and planned grazing.

This soil is only moderately suited to urban and recreational uses because of the shrinking and swelling of the soil and the dense, clayey layers. Proper design and installation of structures help to overcome these limitations.

This Truce soil is in capability subclass IIe and in the Tight Sandy Loam range site.

TuC—Truce fine sandy loam, 3 to 5 percent slopes. This soil is deep. It is on gently sloping, low, convex hillsides. The mapped areas are irregularly shaped and range from 8 to about 90 acres.

Typically, this soil has a neutral, dark brown fine sandy loam surface layer about 7 inches thick. The subsoil to a depth of 21 inches is slightly acid, yellowish red clay. To a depth of 51 inches it is clay that has fragments of shale in the lower part. It ranges from neutral and dark yellowish brown in the upper part to moderately alkaline and light yellowish brown in the lower part. The underlying material to a depth of 80 inches is moderately alkaline, light gray very shaly clay.

This soil is well drained. Permeability is slow, and the available water capacity is low. The surface layer is very hard and massive when the soil is dry. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is moderate. This soil is droughty. It can be worked only within a narrow range of moisture content. After rainfall, a thick crust forms on the surface in tilled areas as the soil dries. The root zone is deep, but the clayey layers impede penetration by plant roots.

Included with this soil in mapping are small areas of Bonti soils, which are underlain by sandstone strata, and Cona and Owens soils in steeper areas than the Truce soil. Also included are areas, less than 4 acres in size, of eroded Truce soils and areas, less than 2 acres in size, of stony Truce soils. The included soils make up 5 to 15 percent of the map unit.

This Truce soil is used mainly as rangeland. The native plant community is mostly mid grasses and a few scattered post oak trees. Continued overgrazing in some areas has caused an increase of post oak trees and short grasses and an invasion of pricklypear, mesquite, and tasajillo.

This soil has good potential for use as habitat for wildlife. Dove and quail inhabit areas of this soil. Deer and turkey feed in these areas and use cover on adjacent soils.

This soil is moderately suited to improved pasture grasses, such as old world bluestems, kleingrass, weeping lovegrass, and bermudagrass. The droughty nature of the soil limits production. Weed control, fertilizer, and controlled grazing are needed.

This Truce soil is moderately suited to use as cropland. Because the soil is droughty, it is best suited to cool-season crops. Crop residue kept on or near the soil surface helps control water and wind erosion and conserve moisture. Terracing and contour farming help control water erosion.

This soil is only moderately suited to most urban and recreational uses because of slow permeability and shrinking and swelling of the soil resulting from changes in moisture content. Low strength is a limitation for local roads and streets. These limitations can be partly overcome through proper planning and special design of urban structures. Steepness of slope limits some recreational uses.

This Truce soil is in capability subclass IIIe and in the Tight Sandy Loam range site.

TuC3—Truce fine sandy loam, 2 to 5 percent slopes, eroded. This soil is deep and gently sloping. It is on upland ridges and side slopes where a few rills and gullies 3 to 4 feet deep have formed. Erosion has removed so much of the original surface layer that only a few inches remain. In a few small areas, the subsoil is exposed. Most mapped areas are within the boundaries of old cultivated fields. The areas range from 7 to about 40 acres.

Typically, this soil has a neutral, yellowish brown fine sandy loam surface layer about 3 inches thick. The subsoil to a depth of 29 inches is neutral clay that is reddish brown in the upper part and yellowish brown in the lower part. To a depth of 54 inches it is moderately alkaline, yellowish brown clay. The underlying material to a depth of 70 inches is moderately alkaline, stratified light olive brown and light olive gray shaly clay that has mottles in shades of yellow.

This soil is well drained. Permeability is slow, and the available water capacity is low. The surface layer is very hard and massive when this soil is dry. After rainfall, a thick crust forms on the surface as the soil dries. The crust restricts air and water intake. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is moderate where the soil is left bare of vegetation. The soil can be worked easily only within a narrow range of moisture content. The root zone is deep, but the dense clayey subsoil impedes penetration by plant roots. The thin surface layer and the blocky, clayey subsoil release little moisture. The soil becomes droughty early in the growing season.

Included with this soil in mapping are small areas of Bonti soils, which are underlain by sandstone strata, and Owens soils on upper slopes and nose slopes. Also included are small areas of severely eroded soils that are shallower than this Truce soil, a few areas of Truce soils that are not eroded, and a few areas, less than 3 acres in size, of stony Truce soils. The included soils make up less than 20 percent of the map unit.

Nearly all of this Truce soil is used as rangeland. Because most areas were not seeded to suitable range grasses after cultivation ended, the vegetation on this soil is less than its potential. Mesquite, pricklypear, and tasajillo have invaded most areas.

This soil has good potential for use as habitat for wildlife. Dove and quail inhabit areas of this soil. Deer and turkey feed in these areas and use cover on adjacent soils.

This Truce soil is poorly suited to pasture. Old world bluestem and kleingrass are suitable, but production is limited by the droughty nature of the soil. Because of the severe crusting of the soil surface, extra seed is needed to insure a stand. Fertilizer, weed control, and controlled grazing are also needed.

This soil is poorly suited to use as cropland. It is best suited to small grains and cool-season crops. Terracing and contour farming help control erosion and slow runoff. Crop residue left on the surface improves productivity, maintains tilth, and lowers soil temperature.

This soil is only moderately suited to most urban and recreational uses because of shrinking and swelling resulting from changes in moisture content, the slow permeability, the high corrosivity to uncoated steel, and the severe hazard of erosion. These limitations are difficult to overcome. The clayey subsoil is a limitation for septic tank absorption fields. Steepness of slope limits some recreational uses.

This Truce soil is in capability subclass IIIe and in the Tight Sandy Loam range site.

VeB—Venus loam, 1 to 3 percent slopes. This soil is deep and gently sloping. It is on low stream terraces and foot slopes of ridges. The mapped areas are oblong to elongated and range from 5 to about 35 acres.

Typically, this soil has a moderately alkaline loam surface layer about 17 inches thick. It is dark grayish brown in the upper part and brown in the lower part. The subsoil to a depth of 69 inches is moderately alkaline, brownish loam that has threads and concretions of calcium carbonate. The underlying material to a depth of 80 inches is moderately alkaline, reddish yellow loam that has threads and concretions of calcium carbonate.

This soil is well drained. Permeability is moderate, and the available water capacity is high. Runoff is medium, and the hazard of erosion is moderate. This soil can be easily worked. When plowed it crumbles and forms good seedbeds. The root zone is deep, and roots can easily penetrate the lower layers. The high content of calcium carbonate causes iron chlorosis in sensitive plants.

Included with this soil in mapping are small areas of Frio soils near the edge of flood plains and soils on upper slopes that are closely similar to the Venus soil but have a higher equivalent of calcium carbonate. The included soils make up as much as 15 percent of the map unit.

The Venus soil is used mainly as cropland, and it is well suited to this use. This soil is used for forage and grain sorghum and for small grains. Terracing and contour farming slow runoff and reduce erosion. Crop residue left on or near the soil surface helps control erosion and improves soil tilth.

This soil is well suited to pasture, mainly improved bermudagrass, kleingrass, johnsongrass, weeping lovegrass, indiangrass, switchgrass, sweetclover, and vetch. Fertilizer, weed control, and controlled grazing are needed.

Some areas of this Venus soil are used as rangeland. The climax vegetation is a true grass prairie of mid and tall grasses; hackberry, elm, and pecan trees along drainageways; and scattered motts of live oak trees. Continued overgrazing causes brush to invade. Ponds constructed on this soil are likely to seep.

This soil has good potential for use as habitat for wildlife. Dove, quail, turkey, and songbirds nest and feed in areas of this soil. Deer feed there and inhabit nearby brushy areas. A good selection of forbs for deer forage is available.

This soil is well suited to most urban and recreational uses. Low strength is a limitation for local roads and streets. This limitation can be overcome by good design and proper installation. Because of seepage, this soil is poorly suited to sewage lagoons.

This Venus soil is in capability subclass IIe and in the Clay Loam range site.

VeC—Venus loam, 3 to 8 percent slopes. This soil is deep amd gently sloping to sloping. It is on ancient stream terraces and in valley fill areas below limestone outcrops. The mapped areas are longer than they are wide and follow the contour of the slope. They range from 10 to about 160 acres.

Typically, this soil has a moderately alkaline, dark brown loam surface layer about 14 inches thick. The subsoil to a depth of 70 inches is moderately alkaline sandy clay loam that has threads and concretions of calcium carbonate. It is brown in the upper part, pale brown in the middle part, and light yellowish brown in the lower part.

This soil is well drained. Permeability is moderate, and the available water capacity is high. Runoff is medium, and the hazard of water erosion is severe. The root zone is deep and is easily penetrated by plant roots.

Included with this soil in mapping are small areas of eroded Venus soils and soils that are similar to Venus soils but have a higher equivalent of calcium carbonate. The included soils make up as much as 15 percent of the map unit.

This Venus soil is mainly used as rangeland (fig. 24). The native vegetation is a mid and tall grass prairie that has a few scattered motts of live oak trees. Brushy plants invade following prolonged periods of continuous overgrazing. Ponds constructed on this soil generally do not hold water.

This soil has good potential for use as habitat for wildlife. Dove, quail, and songbirds inhabit areas of this soil. Deer inhabit areas where woody plants have invaded. A good selection of forbs and grasses provide seed for game birds. A good selection of forbs for deer forage is available, but little cover and protection for escape and resting are provided.

This soil is well suited to pasture, mainly improved bermudagrass, kleingrass, indiangrass, switchgrass, sweetclover, and vetch. Weed control, fertilizer, and controlled grazing are needed.

This Venus soil is only moderately suited to use as cropland because of the steepness of slope and the severe hazard of erosion. Management objectives are controlling erosion, improving soil tilth, and conserving soil moisture. Terracing and contour farming help slow runoff and control erosion. Grassed waterways are needed for terrace outlets. Close-spaced crops that produce large amounts of residue and crop residue left near the soil surface help slow runoff, improve tilth, and conserve soil moisture.

This soil is well suited to most urban uses; however, steepness of slope, the hazard of erosion, and low strength as it affects streets and roads are limitations. Seeding bare construction sites to grass and using good design and proper installation of structures can overcome these limitations.

This soil is only moderately suited to recreational uses because of steepness of slope.

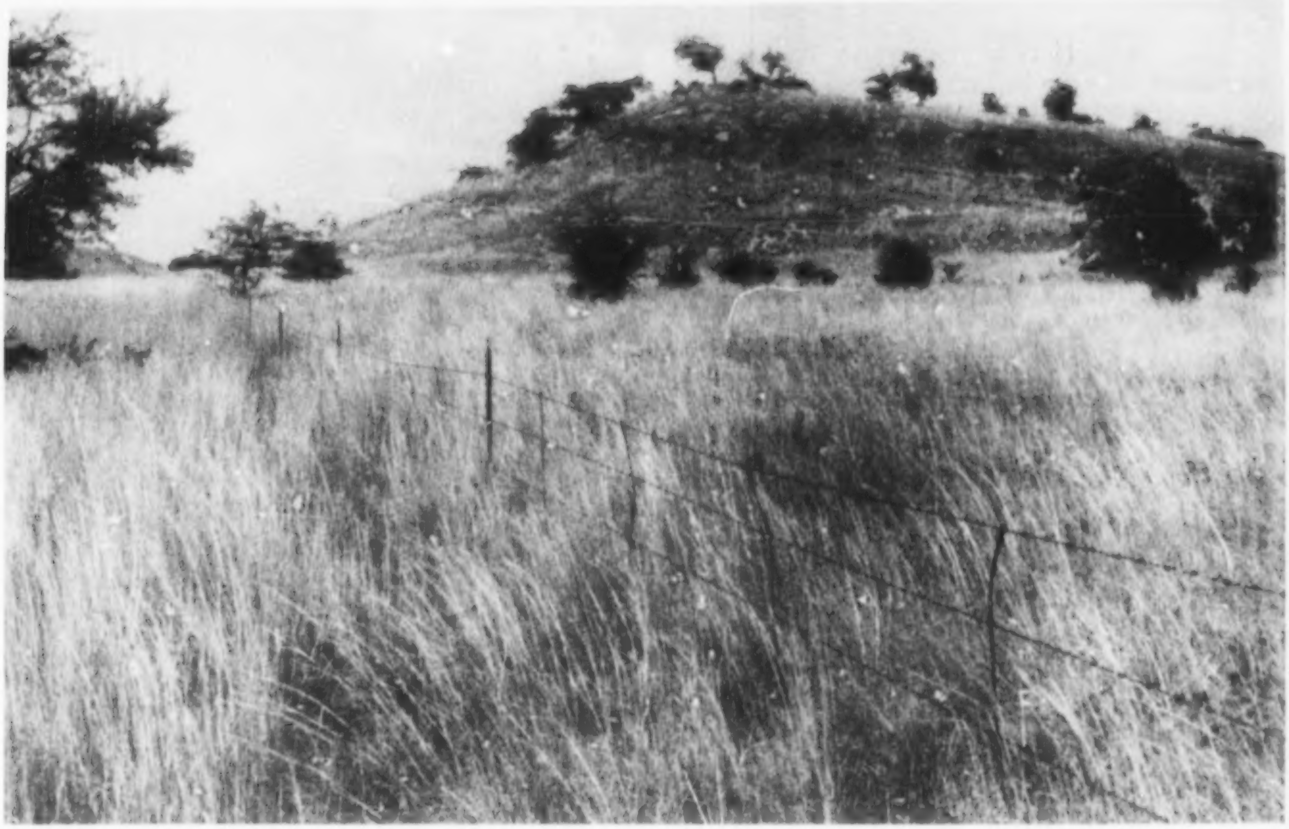


Figure 24.—This rangeland area of Venus loam, 3 to 8 percent slopes, is on foot slopes below areas of the Brackett-Aledo complex, 5 to 20 percent slopes (in the background).

This Venus soil is in capability subclass IVe and in the Clay Loam range site.

VrC—Vernon clay, 3 to 8 percent slopes. This soil is moderately deep. It is on gently sloping and sloping uplands. A few large geologically eroding areas are in about 40 percent of the delineations of this map unit and make up as much as 30 percent of each mapped area. A few of these eroded areas are as large as 25 acres. These areas have numerous fragments, mainly 1 to 6 inches across, on the surface and support sparse vegetation. The mapped areas are oblong to irregularly shaped and range from 5 to about 120 acres.

Typically, this soil has a moderately alkaline, reddish brown clay surface layer about 4 inches thick. The subsoil to a depth of 32 inches is moderately alkaline clay that is reddish brown in the upper part and red in the lower part. The underlying material to a depth of 60 inches is moderately alkaline, weak red shaly clay.

This soil is well drained. Permeability is very slow, and the available water capacity is low. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is slight. The rapid runoff and moderate rooting depth cause the soil to be droughty. Penetration by plant roots through the clayey layers is slow. The soils that are grazed become drier and absorb less moisture when they are trampled and the surface litter is removed.

Included with this soil in mapping are small areas of Anocon soils on upper slopes and scattered bands of Wise soils. Areas of the included soils are less than 6 acres and make up less than 20 percent of the map unit.

This Vernon soil is used mainly as rangeland. Most of the areas are an open prairie of mid and short native grasses. Mesquite is invading some areas. Previously cultivated areas can be improved by removing brush, plowing, and seeding to suitable range grasses.

This soil has fair potential for use as habitat for wildlife. Dove and quail inhabit areas of this soil. Deer and turkey feed in these areas and use cover on adjacent soils.

This soil is poorly suited to crops and pasture. The severe hazard of erosion, rapid runoff, and droughtiness are limiting factors.

This soil is poorly suited to most urban and recreational uses. The clayey surface layer that is sticky when wet, very slow permeability, high corrosivity to uncoated steel, severe erosion hazard, and high shrink-swell properties are limiting factors.

This Vernon soil is in capability subclass VIe and in the Shallow Clay range site.

WeC—Weatherford-Duffau complex, 3 to 8 percent slopes. This complex consists of deep soils on gently sloping to sloping uplands. Erosion has removed more than half of the original topsoil in as much as 20 percent of some mapped areas. The mapped areas are on side slopes below ridges and are longer than they are wide. The areas range from 8 to about 300 acres.

This complex is about 45 percent Weatherford soil, 35 percent Duffau soil, and 20 percent other soils. The Weatehrford and Duffau soils are too intermingled to be mapped separately at the selected scale. Weatherford soil is on the higher, more sloping part of the landscape. It has convex slopes and is underlain by weakly cemented sandstone or packsands at a depth of 40 to 60 inches. Duffau soil is on lower concave slopes and is underlain by this same material at a depth of more than 60 inches.

Typically, the Weatherford soil has a neutral, brown very fine sandy loam surface layer about 11 inches thick. The subsoil to a depth of 25 inches is strongly acid, red sandy clay loam. To a depth of 47 inches it is slightly acid, yellowish red sandy clay loam. The underlying material to a depth of 80 inches is slightly acid, reddish yellow weakly cemented sandstone.

Typically, the Duffau soil has a neutral very fine sandy loam surface layer about 16 inches thick. This layer is yellowish brown in the upper part and light brown in the lower part. The subsoil to a depth of 80 inches is yellowish red and reddish yellow sandy clay loam. It is neutral in the upper part and slightly acid in the lower part.

The soils in this complex are well drained. Permeability is moderate. The available water capacity is moderate for Weatherford soil and high for Duffau soil. Runoff is medium, and the hazard of water erosion is severe. Deep, vertical-walled gullies easily form in these soils where water runoff is concentrated. Bare areas are subject to soil blowing. These soils are easy to work throughout a wide range of moisture content. Both soils have deep root zones, and plant roots easily penetrate the lower soil layers.

Included in mapping are small areas of Selden soils in lower positions than the Weatherford and Duffau soils and Keeter and Windthorst soils on upper slopes and ridges. A few uncrossable gullies and some soils that have narrow slopes of more than 8 percent are also included. The included soils make up less than 20 percent of the map unit.

The soils in this complex are used mainly as pasture or rangeland.

These soils are well suited to pasture, mainly improved bermudagrass, kleingrass, weeping lovegrass, indiangrass, switchgrass, vetch, and arrowleaf clover. Pasture management objectives include fertilization, weed control, and controlled grazing.

The well-managed rangeland supports native vegetation of mid and tall grasses and has a scattering of oak trees. Rangeland that has been continuously overgrazed is now dominated by post oak and brush.

These soils have good potential for use as habitat for wildlife. Dove, quail, deer, turkey, and squirrel inhabit areas of this soil. Several of the woody plants, forbs, and grasses provide good cover, browse, mast, and seeds for game birds and animals. Turkeys use the tall grass areas for nesting.

This complex is moderately suited to use as cropland. Low natural fertility and runoff limit production. Concerns in management include controlling water and wind erosion and improving soil tilth. Terracing and contour farming help slow runoff and control erosion. Grassed waterways are needed to stabilize terrace outlets. Crop residue left on the surface and cool-season legumes help slow runoff, improve soil tilth, and control soil blowing.

The soils in this complex are well suited to most urban and recreational uses. Steepness of slope and low strength as it affects streets and roads are the main limitations. Good design and proper installation of structures can easily overcome these limitations. Areas left bare during construction are easily eroded. Steepness of slope restricts the use of these soils for playgrounds.

This complex is in capability subclass IVe. Weatherford and Duffau soils are in the Sandy Loam range site.

WeC3—Weatherford-Duffau complex, 3 to 8 percent slopes, eroded. This complex consists of deep soils on gently sloping to sloping ridges and side slopes. In most areas, the native timber and grasses have been removed, and the soil has been cultivated. Erosion has removed several inches of the original surface layer, and the reddish subsoil is exposed in a few small spots. Because of the deposition of topsoil from these eroded areas, some soils on foot slopes have a thick surface layer. A few rills and shallow to deep gullies have formed in most areas. The mapped areas are irregularly shaped and range from 10 to about 200 acres.

This complex is about 45 percent Weatherford soil, 40 percent Duffau soil, and 15 percent other closely similar soils. The soils in this complex are too intricately mixed to be mapped separately at the selected scale.

Weatherford soil on upper convex slopes and ridges is underlain by weakly cemented sandstone or packsands at a depth of 40 to 60 inches. Duffau soil on lower concave slopes is underlain by this same material at a depth of more than 60 inches.

Typically, the Weatherford soil has a neutral, brownish very fine sandy loam surface layer about 8 inches thick. The subsoil to a depth of 41 inches is medium acid, reddish sandy clay loam. It is underlain by slightly acid, white stratified sandstone.

Typically, the Duffau soil has a neutral, brownish fine sandy loam surface layer about 10 inches thick. The subsoil to a depth of 30 inches is slightly acid, reddish brown sandy clay loam. To a depth of 64 inches it is neutral, reddish and yellowish sandy clay loam. The underlying material is neutral, reddish yellow weakly cemented sandstone.

The soils in this complex are well drained. Permeability is moderate. The available water capacity is moderate for Weatherford soil and high for Duffau soil. Runoff is medium, and the hazards of water erosion and soil blowing are severe in unprotected areas. Both soils are easy to work throughout a wide range of moisture content. The root zone is deep and is easily penetrated by plant roots.

Included in mapping are small areas of Keeter and Windthorst soils on upper slopes. A few small areas of Chaney and Selden soils are along drainageways. A few areas of soils that have a loamy fine sand surface layer are included. Soils that are as much as 35 percent uneroded or have a thick surface layer are in many areas. The included soils make up as much as 15 percent of the map unit.

The soils in this complex are used mainly as pasture or rangeland.

The Weatherford and Duffau soils are well suited to pasture, mainly improved bermudagrass, kleingrass, weeping lovegrass, switchgrass, vetch, and singletary peas. Past erosion has lowered the natural fertility and water-holding capacity of these soils. Concerns in management include stabilizing active gullies, fertilizing, controlling weeds, and proper stocking with planned rest periods.

These soils can support mid and tall native grasses. Because most areas of these soils were once cultivated, the soils are eroded and droughty and they grow poor-quality grasses. These areas can be improved if they are reshaped and reseeded to suitable native grasses.

These soils have good potential for use as habitat for wildlife. Dove and quail inhabit areas of these soils. Deer and turkey feed in these areas and use cover on adjacent soils.

These soils are moderately suited to use as cropland. Controlling erosion is the most critical concern. Contour farming and terraces that have stable outlets emptying onto grassed waterways help to control water erosion. Crop residue left on the soil surface helps to slow runoff and control soil blowing. Cover crops, such as legumes, help control erosion and maintain soil fertility.

These soils are well suited to most urban uses. They are only moderately suited to most recreational uses because of the moderate permeability, which affects septic tank absorption systems, and the eroded, sloping topography.

These Weatherford and Duffau soils are in capability subclass IVe and in the Sandy Loam range site.

Wf—Westfork silty clay, occasionally flooded. This soil is deep and nearly level. It is on flood plains of large streams. The mapped areas are longer than they are wide. Slope is 0 to 1 percent.

Typically, this soil has a surface layer that is 31 inches thick. It is neutral, brown silty clay in the upper part and mildly alkaline, dark brown silty clay in the lower part. The subsoil to a depth of 43 inches is moderately alkaline, dark grayish brown silty clay. A buried layer of mildly alkaline, very dark grayish brown silty clay loam extends to a depth of 80 inches.

This soil is well drained. Permeability is very slow, and the available water capacity is high. Runoff is slow, and the hazard of erosion is slight. This soil is subject to flooding about once every 8 to 10 years for very brief to brief periods. The root zone is deep, but penetration by roots, air, and moisture is impeded by the dense, clayey soil layers. Because deep cracks do not form in this soil when it is dry, the intake of air and moisture is limited. When this soil is cultivated, a thick, hard crust forms on the surface.

Included with this soil in mapping are small areas of Balsora and Westfork soils near stream channels. Westfork soils have a loamy surface layer. Also included are a few small spots of soils that have thick stratified loamy and clayey layers about 2 feet below the soil surface. The included soils make up less than 15 percent of the map unit.

Because of droughtiness, this Westfork soil is used mainly as rangeland. Scattered mesquite trees and pricklypear cactus are in many rangeland areas.

Some attempts have been made to cultivate this soil, but at best, it is only moderately suited to cool-season crops.

This soil has fair potential for use as habitat for wildlife. Dove, quail, squirrel, and deer inhabit areas of this soil. Several of the forbs and grasses provide seed for game birds and animals. A good selection of forbs for deer forage is available, but little cover and protection for escape and resting are provided.

This soil is poorly suited to pasture. It is difficult for seedlings to emerge through the thick crust that forms when the surface dries. Plants suitable for pasture include vetch, singletary peas, and kleingrass.

This soil is not suited to urban uses because of flooding. The clayey surface layer and the hazard of flooding are limitations for recreational uses.

This Westfork soil is in capability subclass IIIw and in the Clayey Bottomland range site.

WtC—Windthorst fine sandy loam, 1 to 5 percent slopes. This soil is deep. It is on gently sloping ridges and side slopes of stream divides. Small areas of this soil, mostly on the upper parts of slopes, were once cultivated and are now eroded. The mapped areas are elongated to oval and average about 20 acres. Slope is convex to plane and averages about 2 percent.

Typically, this soil has a neutral, fine sandy loam surface layer about 10 inches thick. This layer is yellowish brown in the upper part and light yellowish brown in the lower part. The subsoil to a depth of 23 inches is medium acid, red clay. To a depth of 34 inches it is medium acid, reddish brown sandy clay that has reddish yellow and dark red mottles. The lower part of the subsoil to a depth of 45 inches is slightly acid, reddish yellow sandy clay loam that has red and brownish yellow mottles. The underlying material to a depth of 60 inches is neutral, light gray, massive clay loam that has yellowish mottles and thin strata of weathered sandstone and soft shale.

This soil is moderately well drained. Permeability is moderately slow, and the available water capacity is moderate. Runoff is medium, and the hazards of water erosion and soil blowing are severe. The surface layer is easy to work within a limited range of moisture content. After rainfall, a crust forms on the surface in tilled areas as the soil dries, causing the soil to seal over. The blocky, clayey subsoil is difficult for roots to penetrate. This soil is droughty during the summer growing season.

Included with this soil in mapping are small areas of Chaney and Selden soils on lower slopes and Keeter, Weatherford, and Wise soils on upper slopes and ridgetops. In a few areas, beds of calcareous, reddish clay outcrop on or near the surface. The included soils make up less than 20 percent of the map unit.

Most of this Windthorst soil is used as rangeland or pasture. The native vegetation is a mixture of mid and tall grasses and a scattering of post oak. In many rangeland areas, oaks and brush are now predominant because of past abuse.

This soil has good potential for use as habitat for wildlife. Dove, quail, squirrel, deer, and turkey inhabit areas of this soil. Several of the woody plants, forbs, and grasses provide good cover, browse, mast, and seeds for game birds and animals.

This soil is moderately suited to pasture, mainly improved bermudagrass, kleingrass, weeping lovegrass, singletary peas, and arrowleaf clover. Fertilizer, weed control, and controlled grazing are needed.

The soil is moderately suited to use as cropland. It is best suited to crops that mature during the cool seasons. Fertility is low, and areas left bare are subject to erosion. Terracing and contour farming help to slow runoff, thereby controlling water erosion. Crop residue left on the surface helps to control soil blowing and to conserve moisture. Cool-season legumes improve tilth and fertility and help to control erosion.

This soil is only moderately suited to most urban and recreational uses because of low strength as it affects roads and streets, shrinking and swelling resulting from changes in moisture content, and the clayey subsoil. This soil is poorly suited to septic tank absorption fields because of the moderately slow permeability. Most limitations can be overcome by good design and proper installation of urban structures.

This Windthorst soil is in capability subclass IIIe and in the Tight Sandy Loam range site.

WtC3—Windthorst fine sandy loam, 2 to 6 percent slopes, eroded. This soil is deep and gently sloping and sloping. It is on upland stream divides and their side slopes. In most areas, this soil was once cultivated. It has lost most of its loamy surface layer as a result of erosion, and the reddish clayey subsoil is exposed in many places. An occasional deep, uncrossable gully and a few shallow, crossable gullies have formed. The mapped areas range from 5 to about 50 acres. Slope is convex to plane and averages about 4 percent.

Typically, this soil has a neutral, brown fine sandy loam surface layer about 4 inches thick. The subsoil to a depth of 28 inches is slightly acid, reddish brown clay that has yellowish red and yellowish brown mottles. To a depth of 37 inches it is neutral, yellowish red clay loam that has red and brownish yellow mottles. The lower part of the subsoil to a depth of 43 inches is moderately alkaline, strong brown clay loam that has red and very pale brown mottles and concretions of calcium carbonate. The underlying material in the upper 9 inches is moderately alkaline, light gray shaly clay. To a depth of 62 inches it grades to yellowish, weakly cemented sandstone interbedded with shaly clay.

This soil is moderately well drained. Permeability is moderately slow, and the available water capacity is moderate. Runoff is rapid, and the hazards of water erosion and soil blowing are severe. The root zone is moderately deep to deep, but the blocky clayey subsoil impedes penetration by plant roots. The rapid runoff and thin surface layer further contribute to the droughty nature of the soil.

Included with this soil in mapping are small areas of Chaney, Keeter, Selden, Weatherford, and Wise soils. Chaney and Selden soils are in lower concave areas than Windthorst soil. Keeter, Weatherford, and Wise soils are on upper slopes and ridgetops. Also included are outcrops of calcareous, reddish clayey soils. In places the reddish clay makes up the subsoil and is within 2 to 4 feet of the surface. Also included are small areas, less than 5 acres in size, of Windthorst soils that are not eroded. The included soils make up as much as 20 percent of the map unit.

This Windthorst soil is used mainly as rangeland or pasture. Forage production and stand maintenance are severely limited by the thin surface layer and the droughty nature of the subsoil. Improved bermudagrass, weeping lovegrass, kleingrass, plains bluestem, vetch, and arrowleaf clover are suitable pasture plants. In some areas, gully control and shaping is needed before planting. Fertilizer needs to be applied to overcome low natural fertility and to maintain grass stands and yields. Weed control and controlled grazing are other concerns in management.

Most of the rangeland areas consist of old cropland fields that were never seeded to quality native grasses after cultivation ended. They now mostly consist of poor quality grasses. The eroded areas can be improved by shaping and by reseeding to quality native grasses.

This soil has fair potential for use as habitat for wildlife. Dove and quail inhabit areas of this soil. Deer and turkey feed in these areas and use cover on adjacent soils.

This soil is poorly suited to use as cropland. Only small tracts that are not eroded are suitable for farming. Concerns in management include controlling erosion, conserving moisture, and maintaining tilth and fertility. Terracing and contour farming help slow runoff and control water erosion. Crop residue left on the surface helps conserve moisture and maintain tilth. Cool-season legumes help control erosion and maintain tilth and fertility.

This soil is only moderately suited to most urban and recreational uses because of the gullies, shrinking and swelling resulting from changes in moisture content, corrosivity to uncoated steel, steepness of slope, and permeability. These limitations can be overcome by good design and proper installation of urban structures. Steepness of slope and the hazard of erosion are limitations to the use of this soil for playgrounds.

This Windthorst soil is in capability subclass VIe and in the Tight Sandy Loam range site.

WzC—Wise clay loam, 3 to 8 percent slopes. This soil is moderately deep and is on gently sloping and sloping low hills and nose slopes. Some areas of this soil have deep, uncrossable, natural drainageways and a few large, deeply dissected, geologically eroding spots of as much as 6 acres. These spots make up as much as 30 percent of some mapped areas. Thin layers of limestone outcrop in some areas. Scattered limestone fragments, as much as 2 feet across, are on the surface below the limestone outcrops. The mapped areas are oblong to elongated and follow the contour of the landscape. They range from 5 to about 50 acres.

Typically, this soil has a moderately alkaline, brown clay loam surface layer about 7 inches thick. The subsoil to a depth of 27 inches is moderately alkaline, light brownish gray clay loam that has mottles in shades of yellow and brown in the lower part. The underlying material to a depth of 60 inches is moderately alkaline, light gray, stratified silt loam and shaly silty clay loam that has mottles in shades of yellow. In places, the surface layer is silty clay loam or loam.

This soil is well drained. Permeability is moderate, and the available water capacity is low. Runoff is medium, and the hazard of water erosion is severe. The hazard of soil blowing is slight. The root zone is moderately deep and is easily penetrated by plant roots. Some roots penetrate parts of the underlying material.

Included with this soil in mapping are small areas of Keeter, Venus, and Vernon soils. Also included are small spots of Wise soils that have lost most of their surface layer as a result of erosion during past cultivation; a few large, deep gullies; and some soils that have narrow slopes of more than 8 percent and a solum thinner than that of the Wise soil. The included soils make up less than 20 percent of the map unit.

This Wise soil is used mainly as rangeland. It is best suited to this use. The native vegetation is a mixture of tall and mid grasses and a scattering of live oak trees.

This soil has fair potential for use as habitat for wildlife. Quail and dove inhabit areas of this soil. Deer and turkey feed in these areas and use cover on adjacent soils.

This soil is moderately suited to pasture, mainly improved bermudagrass, kleingrass, weeping lovegrass, plains bluestem, and vetch. Low available water capacity and runoff limit production. Fertilizer, proper stocking, and controlled grazing are needed.

Small, scattered areas of this soil are suitable for farming, but in general this soil is poorly suited to use as cropland. The severe hazard of erosion and the low available water capacity are limitations.

This soil is only moderately suited to most urban and recreational uses because of the steepness of slope, the severe hazard of erosion, and shrinking and swelling. Sewage effluent seeps to the surface in the more sloping areas.

This Wise soil is in capability subclass IVe and in the Clay Loam range site.

Prime Farmland

In this section, prime farmland is defined and discussed, and the prime farmland soils in Wise County are listed.

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and federal levels, as well as individuals, must encourage and facilitate the wise use of our nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to producing food, feed, forage, fiber, and oilseed crops. Such soils have properties that are favorable for the economic production of sustained high yields of crops. The soils need only to be treated and managed using acceptable farming methods. The moisture supply, of course, must be adequate, and the growing season has to be sufficiently long. Prime farmland soils produce the highest yields with minimal inputs of energy and economic resources. Farming these soils results in the least damage to the environment.

Prime farmland soils may presently be in use as cropland, pasture, or woodland, or they may be in other uses. They are used for producing food or fiber or are available for these uses. Urban or built-up land, public land, and water areas cannot be considered prime farmland. Urban or built-up land is any contiguous unit of land 10 acres or more in size that is used for such purposes as housing, industrial, and commercial sites, sites for institutions or public buildings, small parks, golf courses, cemeteries, railroad yards, airports, sanitary landfills, sewage treatment plants, and water control structures. Public land is land not available for farming in national forests, national parks, military reservations, and state parks.

Prime farmland soils usually get an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The acidity or alkalinity level of the soils is acceptable. The soils have few or no rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not subject to frequent flooding during the growing season. The slope ranges mainly from 0 to 5 percent.

A recent trend in land use in some parts of the survey area has been the conversion of some prime farmland to urban and industrial uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are wet, more erodible, droughty, or difficult to cultivate and less productive than prime farmland.

The following map units, or soils, make up prime farmland in Wise County. The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each unit is given in table A. The soil qualities that affect use and management are described in the section "Detailed Soil Map Units." This list does not constitute a recommendation for a particular land use.

Soils that have limitations, such as a high water table or flooding, may qualify as prime farmland if these limitations are overcome by such measures as drainage or flood control. In the following list, the measures needed to overcome the limitations of a map unit, if any, are shown in parentheses after the map unit name. Onsite evaluation is necessary to determine if the limitations have been overcome by the corrective measures.

AnC	Anocon loam, 2 to 5 percent slopes
Ba	Balsora silt loam, occasionally flooded
BdB	Bastsil loamy fine sand, 0 to 3 percent slopes
BfB	Bastsil fine sandy loam, 0 to 3 percent slopes
BkB	Blanket clay loam, 1 to 3 percent slopes
BoB	Bolar clay loam, 1 to 3 percent slopes
BoC	Bolar clay loam, 3 to 5 percent slopes
ChB	Chaney loamy fine sand, 1 to 4 percent slopes
CoB	Cisco loamy sand, 1 to 3 percent slopes
DfC	Duffau loamy fine sand, 1 to 5 percent slopes
DuB	Duffau fine sandy loam, 1 to 3 percent slopes
Fr	Frio silty clay loam, occasionally flooded
LnB	Lindy loam, 1 to 3 percent slopes
MaB	May fine sandy loam, 0 to 2 percent slopes
PrB	Ponder clay loam, 1 to 3 percent slopes
Ps	Pulexas very fine sandy loam, occasionally flooded
SaB	Sanger clay, 1 to 3 percent slopes
SaC	Sanger clay, 3 to 5 percent slopes
SbB	San Saba clay, 1 to 3 percent slopes
SdB	Selden loamy fine sand, 1 to 3 percent slopes
SgA	Slidell clay, 0 to 1 percent slopes
SgB	Slidell clay, 1 to 3 percent slopes
Tr	Trinity clay, occasionally flooded

VeB	Venus loam, 1 to 3 percent slopes
WtC	Windthorst fine sandy loam, 1 to 5 percent slopes

About 36.8 percent, or 213,800 acres, of the Wise County land area is prime farmland. The largest areas are in map units 2, 4, 5, 8, and 9 on the general soil map. Small scattered areas of prime farmland are in map units 1, 3, 6, and 7. Many acres of prime farmland are used for pecan orchards and cultivated crops of small grains, grain sorghum, forage sorghum, peanuts, and melons. The rest is used as pasture or rangeland.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern that is in harmony with nature.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

Joseph A. Spencer, agronomist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

About 210,200 acres in the survey area was used for crops and pasture in 1984 *(6)*. Of this total 145,000 acres was used for permanent pasture; 6,800 acres for row crops of grain sorghum and peanuts; 800 acres mainly for pecan orchards; and 57,600 acres for close-growing crops, mainly wheat, oats, forage sorghum, melons, and alfalfa.

The potential of the soils in Wise County is good for increased production of food. Several thousand acres of potentially good cropland is currently used as rangeland and pasture. In addition to the reserve productive capacity represented by this acreage, food production could be increased considerably by applying the latest crop production technology to all the cropland in the county. This soil survey can greatly facilitate the application of such technology.

The acreage of the agricultural land in Wise County is slowly decreasing as more land is used for urban and commercial development and for mining. In 1984, about 18,800 acres in Wise County was mined land, urban land, or built-up land.

Water erosion is the major concern on nearly all the cropland that has slope of more than 1 percent. Water erosion is a particularly severe hazard on Bonti, Chaney, Duffau, Keeter, Truce, Weatherford, and Windthorst soils.

Loss of the surface layer through erosion is damaging. Productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Soils that have a thin, loamy surface layer and a clayey subsoil are especially damaged when the surface layer is lost. Many acres of naturally droughty Keeter, Truce, and Windthorst soils have been severely damaged in this way. Erosion also damages soils that have a layer of bedrock that limits the depth of the root zone. Shallow and moderately deep soils that are underlain by bedrock include Bolar, Bonti, Lindy, Purves, and Speck soils.

Soil erosion on farmland results in sedimentation. Control of erosion minimizes sedimentation and improves the quality of water for municipal use, for recreation, and for fish and wildlife.

Erosion control practices provide a protective surface cover, less runoff and soil blowing, and an increased rate of water infiltration. A cropping system that keeps vegetative cover on the soil for extended periods holds soil losses to amounts that maintain the productive capacity. On livestock farms that require pasture and hay, perennial grasses and legumes in the cropping or pasture system help to control the amount of erosion on sloping land, provide nitrogen, and improve the physical condition of the soil.

Tillage systems that leave crop residue on the surface reduce runoff and help to control erosion. Soil compaction is reduced if fewer trips are made over the soil. Residue management and less soil disturbance reduce evaporation of moisture from the soil. These tillage systems also conserve energy.

Terraces and diversions reduce the length of slope, slow runoff, and help to control erosion. They are most practical on deep, well drained and moderately well drained soils that have regular slopes. Adequate protective outlets for terraces and diversions on Duffau, Keeter, and Weatherford soils are a major factor in the planning and installation of terraces and diversions. Many drainageways that are needed for terrace outlets are deep or gullied. Bolar, Ponder, Sanger, Slidell, Venus, and Windthorst soils are suitable for terraces when grassed waterways and stable outlets can be established. The other soils are less suitable for terraces and diversions because of steepness of slope, a sandy surface texture, or bedrock at a depth of less than 20 inches.

Wind erosion is a hazard on the sandy Duffau, Bastsil, Chaney, Nimrod, and Selden soils. Strong winds can damage these soils in a few hours if they are dry and do not have vegetative cover or surface mulch. Vegetative cover, surface mulch, or maintaining rough surfaces by proper tillage at timely intervals minimizes soil blowing. Crop residue and stripfarming provide protection to emerging seedlings that are easily damaged by soil blowing.

Information on erosion control practices for each kind of soil can be obtained at the local office of the Soil Conservation Service.

Drainage is not a problem on most soils in Wise County. Trinity and Hassee soils are the only somewhat poorly drained soils. Unless these soils are artificially drained, wetness in depressions can damage crops or pasture plants in some years.

Fertility is naturally high in most soils on flood plains, such as Balsora, Deleon, Frio, and Trinity soils. Many of the moderately alkaline soils on uplands, such as Sanger, Slidell, San Saba, and Venus soils, are also high in natural fertility. The loamy and sandy soils on uplands, such as Bastsil, Chaney, Duffau, Hassee, Keeter, Nimrod, Selden, and Windthorst soils, are low in natural fertility. Most of the sandy and loamy soils of the county require an application of a complete fertilizer. However, most soils that have a calcareous surface layer are naturally high in potassium. Soils that have a fine sand or loamy fine sand surface layer need a split application of a complete fertilizer to keep fertility in balance and to reduce loss of nutrients by leaching. On all soils, the amount and type of fertilizer should be based on the results of soil tests, need of the crop, expected level of yields, previous land use or cropping sequence, and the amount of available soil moisture. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer to apply.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water. Soils that have good tilth are granular and porous. High residue producing crops, such as wheat and grain sorghum, tend to increase organic matter.

Soils that have a light color surface layer of fine sandy loam or very fine sandy loam have a low content of organic matter. Generally, the structure of these soils is weak. Intense rainfall causes the surface to crust. Once the crust forms, it reduces infiltration and increases runoff. Regular additions of crop residue, manure, and other organic material improve soil structure and reduce crust formation. The dark colored Frio, Sanger, Slidell, and Trinity soils have a clayey surface layer and have moderate amounts of organic matter. Generally, such soils have moderate structure. They are difficult to work because they are sticky when wet and extremely hard when dry. Good seedbeds are difficult to prepare. If plowed when wet, these soils tend to be very cloddy after drying. Plowing when wet also causes dense plowpans to develop, and these impede the downward movement of plant roots, air, and moisture. Fall plowing generally provides good tilth for spring planting.

Field crops suited to the soils and climate of the survey area include some that are not commonly grown. Grain sorghum and peanuts are the principal row crops. Cotton, corn, guar, sunflowers, soybeans, castor beans, and similar crops can be grown if economic conditions are favorable.

Wheat, oats, and forage sorghum are the common close-growing crops. Rye, barley, vetch, alfalfa, watermelons, cantaloupes, and millet are also grown. Grass and legume seed can be produced from kleingrass, switchgrass, old world bluestems, weeping lovegrass, arrowleaf clover, and vetch.

Special crops have been grown commercially, but few are now grown. These crops include black-eyed peas, cabbage, carrots, grapes, okra, onions, tomatoes, turnips, sweet potatoes, and squash.

Deep soils that have natural drainage and that warm up early in the spring are especially well suited to many vegetables and small fruits. In the survey area these are the Bastsil, Chaney, Duffau, May, Selden, Venus, and Windthorst soils that have slopes of less than 3 percent.

Crops can generally be planted and harvested earlier on these soils than on other soils in the survey area. Timely irrigation in many years doubles the yields of most horticultural crops.

Most of the deep, well drained, loamy and sandy soils in the survey area are suitable for orchards, vineyards, and nursery plants. Soils in low positions, where frost is frequent or drainage is poor, are poorly suited to early vegetables, small fruits, and orchards.

The latest information and suggestions for growing special crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

Pasture is important in Wise County because raising of livestock is the main farm enterprise. For the past several years, the trend has been to convert land from other uses to pasture and hay. Land used for pasture and hay generally is planted to introduced grasses that respond to good management. These grasses are used mainly to provide year-round grazing in combination with native range and supplemental pastures. Where pasture grasses are properly managed, erosion is not a problem.

Among the most important grasses are improved bermudagrass, common bermudagrass, improved varieties of kleingrass, weeping lovegrass, johnsongrass, indiangrass, switchgrass, plains bluestem, and Caucasian bluestem.

Improved bermudagrass, such as coastal bermudagrass, switchgrass, and kleingrass are better suited to deep soils on bottom lands, such as Balsora, Deleon, Frio, Pulexas, and Trinity soils, than to other soils in the county. These grasses, however, will grow on most of the soils in the county if a good seedbed can be prepared. If soils, such as Windthorst, Truce, and Keeter, are eroded, management problems with improved bermudagrass, switchgrass, and kleingrass develop because of the droughty nature of these eroded soils. These soils and other droughty soils, such as Purves, Aledo, Speck, and Somervell soils, are better suited to drought-resistant grasses, such as plains and Caucasian bluestem.

Weeping lovegrass is widely suited and provides good yields of forage on sandy and loamy soils on uplands, such as Cisco, Nimrod, Selden, Keeter, Chaney, and Duffau soils.

Forage legumes overseeded into permanent pastures provide nitrogen fixation for pastures, extend the grazing season, and improve pasture quality. The two most important legumes overseeded into permanent pastures are arrowleaf clover and hairy vetch. The arrowleaf clover is more suitable for overseeding into loamy or sandy soils, such as Windthorst, Duffau, Bastsil, Pulexas, and Selden soils. Hairy vetch is better suited to overseeding into the Blanket, Sanger, Slidell, and San Saba soils that have a clay loam or clay surface texture.

Good management practices for pasture are fertilization, rotation grazing to maintain proper grazing height of forage, weed and brush management, and an adequate water supply. Good management practices for hay are fertilization and cutting the forage at the correct height and at the proper stage of growth.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for use as cropland *(8)*. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major, and generally expensive, landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode, but they have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless a close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

There are no subclasses in class I because the soils of this class have few limitations. The soils in class V are subject to little or no erosion, but they have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation. Class V has only the subclasses indicated by *w, s,* or *c.*

Rangeland

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 6 shows, for each soil, the range site and the potential annual production of vegetation in favorable, average, and unfavorable years. Only those soils that are used as rangeland or are suited to use as rangeland are listed. Explanation of the column headings in table 6 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was established during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Potential annual production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. Total production includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants, but it does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Range management requires a knowledge of the kinds of soil and of the potential climax plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the climax community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, reduction of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Rangeland is land on which native vegetation consists of a wide variety of grasses, grasslike plants, forbs, shrubs, and trees. Rangeland does not receive regular or frequent cultural treatment. Management to conserve soil and water and improve production is accomplished by balancing livestock numbers to forage production and rotating livestock to allow desirable plants to improve vigor, produce seed, and establish seedlings.

The native forage of Wise County is rangeland. About 59 percent of Wise County, or 350,000 acres, is used as rangeland.

The three Major Land Resource Areas, the Grand Prairie, West Cross Timbers, and North Central Prairie, are rangeland. The Grand Prairie area of Wise County, when first settled, was a tall grass prairie interspersed with widely scattered trees or motts of trees that were mainly along waterways. The Cross Timbers and North Central Prairie areas were a post oak savanna that had tall to mid grasses. Dominant vegetative plants were indiangrass, big bluestem, switchgrass, little bluestem, native legumes, and forbs. Wildfire was a natural part of the rangeland ecosystem, repeatedly burning areas to inhibit the spread and thickening of oaks and underbrush, thus perpetuating the production of tall grasses, legumes, and forbs.

After settlement, wildfires were suppressed, fences were constructed, and domestic livestock were confined at very heavy stocking rates, thereby overgrazing productive tall grasses, legumes, and forbs. This led to a rapid increase in canopy of trees and associated brush species that shaded the understory plant community on the post oak savanna. The sun-loving tall grasses decreased, and the shade-tolerant forage plants, such as purpletop tridens, and cool-season plants, such as Texas wintergrass increased. Today, forage production is very limited on the post oak ranges that once were lush savanna grasslands. It is also limited on the tall grass prairie.

In order to return the rangelands of Wise County to the once natural productive state of the savanna, the woody canopy must be reduced. This can be done by prescribed burning, herbicides, or by mechanical means. Less canopy will allow the necessary sunlight for growth of tall grasses. Proper grazing and brush management are also needed to reestablish the once productive rangelands.

Range management requires knowledge of the kinds of soil and of climax vegetation. It also requires an evaluation of present range condition. Range condition is determined by comparing the present plant community with climax vegetation on a given range site. The more closely the existing community resembles climax vegetation, the better the range condition.

A primary objective of range management is to keep rangeland in excellent or good condition to conserve water, improve yields, and protect soil. The main concern in management is to be able to recognize important changes in the vegetative cover on a given range site. These changes take place gradually and can be misinterpreted or overlooked. Growth encouraged by heavy rainfall can lead to the conclusion that the range is in good condition, when actually the cover is weedy and the long-term trend is toward lower production. On the other hand, rangeland that has been closely grazed for short periods under careful supervision, may have a degraded appearance that temporarily conceals its quality and ability to recover.

Range Sites and Condition Classes

A range site is a distinctive kind of rangeland that produces characteristic vegetation that differs from climax vegetation on other range sites in kind, amount, and proportion of range plants. Soils that produce about the same kinds and number of plants make up a range site. Soil properties that affect moisture supply and plant nutrients have the most influence on productivity. Soil reaction, salt content, topography, and a seasonal high water table are also important.

Climax vegetation on the range site is the stabilized plant community that the site is capable of producing. It consists of plants that were growing in an area when it was first settled. Climax vegetation reproduces itself and changes very little so long as its environment remains unchanged. In general, it is the most productive combination of forage plants possible.

Decreasers are plants in climax vegetation that tend to decrease in relative amount under close grazing. They generally are the tallest and most productive perennial grasses and forbs and the most palatable to livestock.

Increasers are plants that increase in relative amount as the more desirable decreasers are reduced by close grazing. They are commonly shorter than decreasers and are generally less palatable to livestock.

Invaders are plants that cannot compete with climax vegetation for moisture, nutrients, and light. However, invaders grow along with increasers after the climax vegetation has been reduced by grazing.

Range condition is judged according to standards that apply to a particular range site. It expresses the present kind and amount of vegetation in relation to the climax plant community for that site.

Four range condition classes are used to indicate the degree of departure from potential, or climax, vegetation brought about by grazing or other uses. The classes show present condition of native vegetation on a range site in relation to native vegetation that could grow there. A range is in excellent condition if 76 to 100 percent of the vegetation is of the same kind as that in the climax stand; in good condition if the percentage is 51 to 75; in fair condition if the percentage is 26 to 50; and in poor condition if the percentage is 25 or less.

Potential forage production depends on the range site. Current forage production depends on range condition and moisture available to plants during the growing season.

Following years of prolonged overuse on rangeland, seed sources of desirable vegetation are eliminated. Vegetation can be reestablished. Brush control, range seeding, fencing, development of water sites, or other mechanical treatment can be used to revitalize stands of native plants. Thereafter, deferred grazing, proper grazing use, and a planned grazing system are needed to maintain and improve the range.

Good management generally results in optimum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below potential vegetation meets grazing needs.

There are 20 range sites in the survey area. They are the Blackland, Clay Loam, Clay Loam Slope, Clayey Bottomland, Claypan Prairie, Deep Redland, Deep Sand, Loamy Bottomland, Loamy Prairie, Loamy Sand, Low Stony Hill, Redland, Rocky Hill, Sandstone Hill, Sandy, Sandy Loam, Shallow, Shallow Clay, Steep Adobe, and Tight Sandy Loam range sites.

Blackland range site. The Medlin, Sanger, San Saba, and Slidell soils (map units MdE, SaB, SaC, SaD, SbB, SgA, and SgB) are in this site. The climax vegetation is a tall grass prairie that has a few live oak, elm, and hackberry along draws and in occasional motts. The composition by weight is 90 percent grasses, 10 percent forbs, and a trace of woody plants. This site has high natural fertility and is very productive.

Indiangrass, big bluestem, switchgrass, and little bluestem produce 75 percent of the forage in climax condition. Many other grasses make up the other 15 percent, but the most important are sideoats grama, Texas wintergrass, Texas cupgrass, tall dropseed, silver bluestem, Florida paspalum, and Virginia wildrye. About 24 forbs grow on this site. Maxmillian sunflower, Engelmann-daisy, halfshrub sundrop, and gaura are the most important to livestock.

Overgrazing depletes little bluestem, big bluestem, indiangrass, switchgrass, eastern gamagrass, and the palatable forbs. They are replaced by silver bluestem, Texas wintergrass, sideoats grama, tall dropseed, less palatable forbs, and other mid grasses. If overgrazing continues, these increaser plants are grazed out and are replaced by invaders, such as buffalograss, Texas grama, tumblegrass, threeawn, annual forbs, mesquite, elm, bois d'arc, and honeylocust.

Clay Loam range site. The Blanket, Bolar, Ponder, Somervell, Venus, and Wise soils (map units BkB, BoB, BoC, PrB, SoC, VeB, VeC, and WzC) are in this range site. The climax plant community is tall grass prairie that is highly productive. The composition by weight is 90 percent grasses, 10 percent forbs, and a trace of woody plants.

Little bluestem, big bluestem, and indiangrass produce 70 percent of the forage in climax condition. Switchgrass, Virginia wildrye, Canada wildrye, sideoats grama, and Texas wintergrass make up 15 percent. Other short to mid grasses, such as dropseed, vine mesquite, Texas cupgrass, white tridens, silver bluestem, hairy grama, seep muhly, and buffalograss, make up 5 percent. More than 20 forbs grow on this site. Engelmann-daisy, Maximilian sunflower, guara, and heath aster are important to livestock. Woody plants include liveoak, elm, and hackberry.

Overgrazing depletes little bluestem, big bluestem, indiangrasss, switchgrass, and palatable forbs. They are replaced by increasers, such as sideoats grama, Texas wintergrass, tall dropseed, silver bluestem, and less palatable forbs. If overgrazing continues, these plants are grazed out and are replaced by invaders, such as Texas grama, tumblegrass, buffalograss, threeawn, windmillgrass, western ragweed, annual forbs, mesquite, elbowbush, sumac, and honeylocust.

Clay Loam Slope range site. The Set soil (map unit SeE) is in this range site. The climax plant community is a prairie of tall and mid grasses and occasional woody plants. The composition by weight is 80 percent grasses, 5 percent forbs, and 15 percent woody plants. Forage production is good.

Big bluestem, indiangrass, switchgrass, little bluestem, and sideoats grama produce 60 percent of the forage in climax condition. Vine mesquite, silver bluestem, Texas wintergrass, tall dropseed, white tridens, buffalograss, and Texas cupgrass make up 15 percent. Other short to mid grasses, such as hairy grama, blue grama, perennial threeawn, low panicums, wildrye, and cottontop, make up 5 percent of the production. Halfshrub sundrop, guara, bundleflower, heath aster, and Maximilian sunflower are important to livestock. Woody plants include live oak, Texas oak, Texas ash, cedar elm, and hackberry.

Overgrazing depletes indiangrass, big bluestem, little bluestem, switchgrass, sideoats grama, and palatable forbs. They are replaced by increasers, such as vine mesquite, silver bluestem, Texas wintergrass, tall dropseed, buffalograss, Texas cupgrass, and less palatable forbs. If overgrazing continues, these plants are grazed out and are replaced by invaders, such as hairy tridens, low panicums, hooded windmillgrass, Texas grama, threeawn, annual grasses and forbs, western ragweed, gray goldaster, milkweed, nightshade, juniper, shin oak, elbowbush, pricklypear, and mesquite.

Clayey Bottomland range site. The Deleon, Trinity, and Westfork soils (map units De, Tr, and Wf) are in this range site. The climax plant community is a mid- to tall-grass savanna that has a 20 percent tree canopy. The canopy is heavier next to streams. Shade-tolerant grasses and sedges grow under the tree canopy and warm-season grasses and forbs dominate the open areas. The composition by weight is 75 percent grasses, 5 percent forbs, and 20 percent woody plants.

Canada wildrye, Virginia wildrye, Texas wintergrass, sedges, and Texas bluegrass produce 25 percent of the forage in climax condition. Indiangrass, little bluestem, big bluestem, switchgrass, sideoats grama, vine mesquite, white tridens, and eastern gamagrass make up 30 percent. Blue grama, western wheatgrass, buffalograss, silver bluestem, and other grasses make up the rest. Forbs include tickclover, wildbean, lespedeza, snoutbean, guara, dalea, and Maximilian sunflower. Woody plants include oak, hackberry, pecan, cottonwood, elm, black willow, ash, and woody vines.

Livestock prefer this range site. Heavy grazing and suppression of fires allow woody plants to form a dense canopy and thus cause a reduction in warm-season grasses and forbs. Shade-tolerant grasses then dominate the herbaceous production, and total usable forage is drastically reduced.

Claypan Prairie range site. The Hassee and Thurber soils (map units HaB and ThB) are in this range site. The climax plant community is a mid- to short-grass prairie and a trace of woody plants. The composition by weight is 90 percent grasses and 10 percent forbs.

Sideoats grama, Arizona cottontop, blue grama, and vine mesquite produce 60 percent of the forage in climax condition. Texas wintergrass, tall dropseed, silver bluestem, and buffalograss make up 15 percent. Western wheatgrass, purple and Wright threeawn, white tridens, and other grasses make up the rest. The forbs include heath aster, bushsunflower, gayfeather, Engelmann-daisy, western ragweed, sensitivebriar, and trailing ratany. Woody plants include ephedra, lotebush, hackberry, and elm.

Overgrazing eventually decreases sideoats grama, blue grama, Arizona cottontop, and palatable forbs. They are replaced by Texas wintergrass, silver bluestem, buffalograss, dropseed, and less palatable forbs. If overgrazing continues, these plants are grazed out and replaced by invaders, such as Texas grama, hairy tridens, tumblegrass, annual lovegrass, tumble lovegrass, weedy forbs, mesquite, and pricklypear. Lotebush increases as the plant community deteriorates.

Deep Redland range site. The Lindy and Mingo soils (map units LnB and MoB) are in this range site. The climax plant community is a tall grass prairie interspersed with mid grasses. The composition by weight is 90 percent grasses, 5 percent forbs, and 5 percent woody plants.

Indiangrass, big bluestem, and little bluestem produce 55 percent of the forage in climax condition. Sideoats grama, tall dropseed, cane and silver bluestem, and vine mesquite make up 15 percent. Plains lovegrass, white tridens, and Texas cupgrass add 5 percent. Texas wintergrass and Canada wildrye produce 10 percent. Other grasses include buffalograss, fall witchgrass, and Wright threeawn. The forbs include Maximilian sunflower, Engelmann-daisy, bushsunflower, bundleflower, prairieclover, heath aster, and western ragweed. Woody plants include oak, hackberry, elm, bumelia, redbud, greenbrier, and sumac.

Indiangrass, big bluestem, little bluestem, and wildrye are preferred by livestock, and they are grazed out first if grazing is not controlled. These plants are replaced by sideoats grama, tall dropseed, silver bluestem, Texas wintergrass, and vine mesquite. Cessation of fire and continued overgrazing cause a decline in these plants, an increase in woody plants, and an invasion of mesquite, juniper, pricklypear, catclaw, lotebush, prairie coneflower, weedy forbs, Texas and red grama, hairy tridens, tumblegrass, and windmillgrass.

Deep Sand range site. The Patilo soil (map unit PhC) is in this range site. The climax plant community is a post oak and blackjack oak savanna that has a 20 to 25 percent canopy. The composition by weight is 65 percent grasses, 5 percent forbs, and 30 percent woody plants.

Indiangrass, big bluestem, sand bluestem, sand lovegrass, and purpletop tridens produce 40 percent of the forage in climax condition. Sand dropseed, sand paspalum, Scribner panicum, and little bluestem make up 20 percent. Red lovegrass and perennial threeawn make up the rest. Forbs include wildbean, lespedeza, dayflower, evening primrose, bundleflower, sand lily, bullnettle, snake cotton, prairie senna, and tickclover. Post oak and blackjack oak are 25 percent of the composition, and bumelia, greenbrier, and skunkbush sumac make up the rest of the woody plants.

Indiangrass, big bluestem, sand bluestem, and sand lovegrass are preferred by livestock, and they are grazed out first if grazing is not controlled. These plants are replaced by sand dropseed, sand paspalum, fringeleaf paspalum, scribner panicum, and purpletop tridens. Cessation of fire and continued overgrazing cause a decline of these forage plants, an increase in woody plants, and an invasion of pricklypear, crabgrass, sandbur, and weedy forbs. Oaks increase to form a dense canopy, and forage production is reduced to nothing.

Loamy Bottomland range site. The Balsora, Frio, and Pulexas soils (map units Ba, Bb, Bc, Fr, Ps, and Pu) are in this range site. The climax plant community is a tall grass savanna that has trees shading about 20 percent of the ground. The composition by weight is 75 percent grasses, 5 percent forbs, and 20 percent woody plants.

Indiangrass, switchgrass, Canada wildrye, Virginia wildrye, big bluestem, little bluestem, and purpletop tridens produce 70 percent of the forage in climax condition. Tall dropseed, meadow dropseed, eastern gamagrass, vine mesquite, sand lovegrass, Texas bluegrass, beaked panicum, Florida paspalum, sideoats grama, Texas wintergrass, and sedges make up the rest of the grasses. Forbs include Maximilian sunflower, wildbean, snoutbean, lespedeza, guara, Engelmann-daisy, penstemon, and tickclover. Oak, elm, hackberry, greenbrier, pecan, cottonwood, sumac, Texas ash, and grapes are the woody plants.

Livestock prefer this site. Overgrazing and fire suppression cause a reduction in warm-season grasses and forbs and an increase in tree and brush canopy. Shade-tolerant grasses and forbs then dominate the herbaceous production, and forage production is drastically reduced. If this site is in poor condition, woody plants dominate. Mesquite, milkweed, tumblegrass, Texas grama, and common bermuda invade.

Loamy Prairie range site. The Anocon soil (map unit AnC) is in this range site. The climax plant community is a tall- to mid-grass prairie. The composition by weight is 90 percent grasses and 10 percent forbs. Woody plants rarely occur.

Indiangrass, big bluestem, and little bluestem produce 60 percent of the forage in climax condition. Switchgrass, sideoats grama, blue grama, and tall dropseed make up 25 percent. Texas wintergrass, silver bluestem, Texas cupgrass, vine mesquite, buffalograss, and white tridens make up the rest. Many forbs, including Englemann-daisy, Baldwin ironweed, bundleflower, prairie-clover, yellow neptunia, gayfeather, guara, heath aster, wild alfalfa, sagewort, sensitivebriar, and trailing ratany, grow on this site.

Livestock prefer this site. Overgrazing causes big bluestem, indiangrass, and palatable forbs to decrease. They are replaced by little bluestem and sideoats grama. If overgrazing continues, these plants give way to lower quality increasers, such as dropseed, silver bluestem, Texas wintergrass, buffalograss, and vine mesquite. If this range site is in poor condition, old field threeawn, Texas grama, hairy grama, rough tridens, jointtail, windmillgrass, western ragweed, curlycup gumweed, mesquite, and many annuals invade. Production is severely reduced.

Loamy Sand range site. The Bastsil, Chaney, Cisco, Duffau, and Selden soils (map units BdB, ChB, Cob, DfC, and SdB) are in this range site. The climax plant community is a post oak savanna that has mid and tall grasses. The composition by weight is 80 percent grasses, 5 percent forbs, and 15 percent woody plants.

Little bluestem, big bluestem, indiangrass, and sand lovegrass produce 55 percent of the forage in climax condition. Purpletop tridens, cane and silver bluestem, sand and tall dropseed, and sideoats grama make up 20 percent. Texas wintergrass, Texas bluegrass, Canada wildrye, Scribner panicum, switchgrass, and plains lovegrass make up the rest of the grasses. Forbs include Englemann-daisy, Maximilian sunflower, sagewort, ragweed, dalea, yellow neptunia, sensitivebriar, wildbean, primrose, gaura, and partridge pea. Post oak produces 10 percent of the woody production. Other woody plants include blackjack oak, greenbrier, bumelia, sumac, pricklyash, hackberry, shin oak, plum, and grapes.

Overgrazing and suppression of fire cause a reduction in tall and mid grasses and palatable forbs and an increase in silver bluestem, dropseed, oak, and other woody plants. Continued abuse results in an invasion of fall switchgrass, windmillgrass, red lovegrass, tumble lovegrass, gummy lovegrass, and threeawn. In its poorest condition, the site is dominated by post oak, blackjack oak, greenbrier, and shin oak. Grass production is eliminated when the canopy closes.

Low Stony Hill range site. The Palopinto soil (map unit PaC) is in this range site. The climax plant community is a savanna of tall and mid grasses and live oak. The tree canopy is less than 20 percent. The composition by weight is 85 percent grasses, 5 percent forbs, and 10 percent woody plants.

Little bluestem, big bluestem, and indiangrass produce 40 percent of the forage in climax condition. Sideoats grama, tall dropseed, vine mesquite, silver bluestem, and cane bluestem make up 15 percent. Texas wintergrass, Canada wildrye, and Virginia wildrye add 10 percent. Texas cupgrass, green sprangletop, plains lovegrass, perennial threeawn, buffalograss, and other grasses make up the rest. Forbs include Maximilian sunflower, bushsunflower, sensitivebriar, dalea, and prairie-clover. Live oak, cedar elm, Texas oak, Texas ash, and hackberry are the woody plants.

Overgrazing and suppression of fire result in a reduction of big bluestem, indiangrass, little bluestem, and palatable forbs. Woody plants, sideoats grama, silver bluestem, wildrye, and less palatable forbs increase. If heavy grazing continues, these forage plants are grazed out and are replaced by Texas wintergrass, buffalograss, and invaders, such as hairy tridens, Texas grama, tumblegrass, red threeawn, other annual grasses and forbs, shin oak, ash, juniper, mesquite, and pricklypear.

Redland range site. The Hensley and Speck soils (map units HeB and SpB) are in this range site. The climax plant community is a prairie of mid and tall grasses interspersed with widely scattered motts of live oak, Texas ash, cedar elm, hackberry, and shin oak. The canopy is less than 10 percent. The composition by weight is 85 percent grasses, 10 percent forbs, and 5 percent woody plants.

Little bluestem, sideoats grama, and indiangrass produce 65 percent of the forage in climax condition. Canada wildrye, switchgrass, and big bluestem add 5 percent. Blue grama, Texas wintergrass, cane bluestem, silver bluestem, and tall dropseed make up 10 percent. Vine mesquite, hairy grama, white tridens, and Texas cupgrass make up the rest of the grasses. Forbs include Englemann-daisy, yellow neptunia, sensitivebriar, wildbean, dalea, prairie-clover, guara, ruellia, bush sunflower, scurfpea, and western ragweed. The main woody plants are live oak, elm, hackberry, Texas ash, Texas oak, and post oak. Other woody plants in small amounts include greenbrier, elbowbush, shin oak, bumelia, and sumac.

Overgrazing and suppression of fire cause woody plants to increase and palatable grasses and forbs to decrease. Continued abuse results in a loss of all of the tall and mid grasses except the Texas wintergrass. Curly mesquite, buffalograss, Wrights threeawn, and invaders, such as Texas grama, hairy tridens, red grama, tumblegrass, other annual grasses and forbs, curlycup gumweed. coneflower, nightshade, juniper, mesquite, catclaw, lotebush, and pricklypear, dominate the site in poor condition.

Rocky Hill range site. The Owens soil (map unit OwE) is in this range site. The climax plant community is mainly mid grasses, live oak, and a few woody shrubs. The composition by weight is 85 percent grasses, 5 percent forbs, and 10 percent woody plants.

Sideoats grama, cane bluestem, silver bluestem, and buffalograss produce 50 percent of the forage in climax condition. Vine mesquite, curlymesquite, Texas wintergrass, Arizona cottontop, and tall dropseed make up 25 percent. Blue grama, hairy grama, rough tridens, perennial threeawn, and Texas cupgrass are 5 percent. Little bluestem, big bluestem, and indiangrass make up the rest of the grasses. Forbs include western ragweed, sagewort, bundleflower, heath aster, gray goldaster, and buckwheat. Live oak is the main woody plant. Others in small numbers include Texas oak, ash, hackberry, elm, ephedra, catclaw, elbowbush, sumac, yucca, and lotebush.

Sideoats grama, cane bluestem, silver bluestem, and palatable forbs decrease if overgrazed. Buffalograss and curlymesquite then increase. If overgrazing continues, they decrease and are replaced with rough tridens, hairy grama, and threeawns. This site severely erodes if the plant cover is lost. Mesquite, lotebush, whitebrush, juniper, pricklypear, tasajillo, and annuals increase and invade to dominate the site in poor condition.

Sandstone Hill range site. The Cona and Darnell-Exray complex soils (map units CsE and DaE) are in this range site. The climax plant community is a savanna of post oak and blackjack oak and an open stand of mid and tall grasses. The composition by weight is 75 percent grasses, 5 percent forbs, and 20 percent woody plants.

Little bluestem is the dominant grass, producing 35 percent of the forage in climax condition. Purpletop tridens, a more shade-tolerant grass, and indiangrass produce 10 percent each. Beaked panicum and sideoats grama combine to equal 10 percent. Numerous other tall and mid grasses make up the rest of the grasses. Lespedeza, wildbean, yellow neptunia, tickclover, snoutbean, sensitivebriar, and dayflower are the main forbs. Post oak and blackjack oak are the main woody plants. Greenbriar, bumelia, skunkbush, Texas ash, honeysuckle, elbowbush, catclaw, lotebush, cedar elm, and pricklyash make up the rest of the woody plants.

Overgrazing and suppression of fire cause little bluestem and palatable forbs to decrease. The woody overstory of oak increases, creating a shaded habitat not suited to most climax grasses. Continued deterioration results in increasing amounts of woody plants on the site. Threeawn, red lovegrass, tumblegrass, Texas grama, western ragweed, curlycup gumweed, mesquite, juniper, pricklypear, skunkbush sumac, oak, and elm increase and invade to dominate the site.

Sandy range site. The Heaton and Nimrod soils (map units PhC and NdB) are in this range site. The climax plant community is a savanna of post oak and blackjack oak, which shade 25 percent of the ground. Post oak is dominant. The open areas are mainly tall grasses. The composition by weight is 75 percent grasses, 5 percent forbs, and 20 percent woody plants.

Little bluestem is the dominant grass, producing 35 percent of the forage in climax condition. Purpletop tridens, a shade-tolerant grass, makes up 15 percent. Indiangrass, switchgrass, sand bluestem, big bluestem, and sand lovegrass add 20 percent. Mid grasses and sedges make up the rest of the grasses. Forbs include Maximilian sunflower, Englemann-daisy, lespedeza, tickclover, snoutbean, yellow neptunia, sensitivebriar, bullnettle, and evening primrose. Post oak produces 10 percent of the total woody production, and blackjack oak produces 5 percent. Elm, coralberry, greenbrier, plum, hawthorn, elbowbush, grapes, berry vine, and pricklyash make up the rest of the woody plants.

If this site is overgrazed and natural fires do not occur, taller grasses are grazed or shaded out, or both, by an increasing canopy of woody plants. Little bluestem, indiangrass, big bluestem, sand bluestem, and switchgrass are replaced by fringeleaf paspalum, tall dropseed, silver bluestem, and other increasing species. If these plants are grazed out, they are replaced by red lovegrass, yankeeweed, bullnettle, snakecotton, ragweed, and croton. Continued deterioration results in dense thickets of woody plants as well as sandbur, pricklypear, beebalm, and pricklypoppy.

Sandy Loam range site. The Arents, Bastsil, Bonti, Exray, Duffau, May, Silawa, and Weatherford soils (map units Ar, BfB, BtC, BxC, DuB, DvC4, MaB, SfC, SfC3, WeC, and WeC3) are in this range site. The climax vegetation is a post oak and blackjack oak savanna that has tall to mid grasses filling the open areas. Oak, mainly post oak, shade 20 to 25 percent of the ground. The composition by weight is 75 percent grasses, 5 percent forbs, and 20 percent woody plants.

Little bluestem is the dominant grass, producing 40 percent of the forage in climax condition. Indiangrass, switchgrass, and purpletop tridens produce 15 percent. Canada wildrye, Virginia wildrye, big bluestem, sand bluestem, sand lovegrass, and sideoats grama make up 15 percent. Numerous other grasses make up the rest. Forbs include Englemann-daisy, sensitivebriar, guara, and native legumes. Post oak and blackjack oak produce 15 percent of the total annual production of woody plants. Many other woody plants, such as elm and greenbrier, make up the rest.

If this site is overgrazed and natural fires do not occur, the woody canopy increases and palatable grasses and forbs decrease (fig. 25). Poor quality grasses and forbs, including annuals, take their place. If abuse persists, oak and increaser woody plants form dense thickets, and mesquite, juniper, catclaw, and pricklypear invade. Forage for livestock is reduced to small amounts.

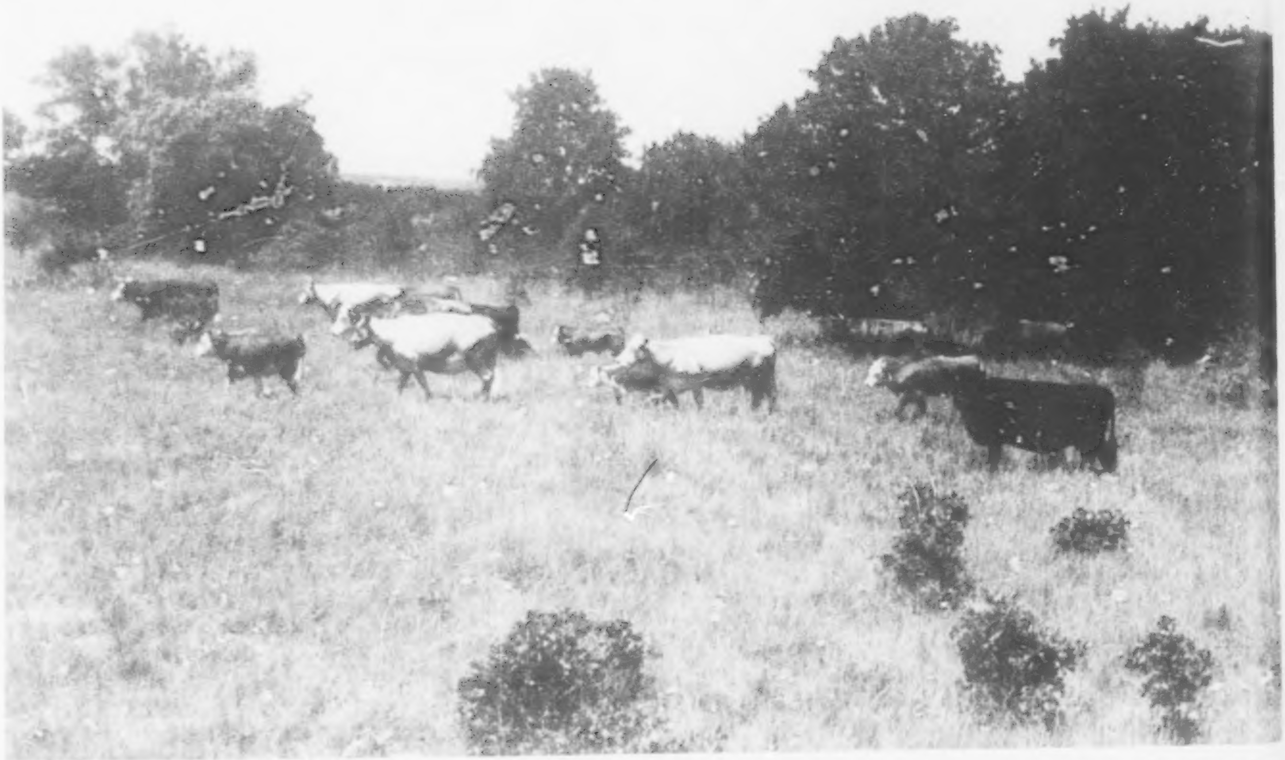


Figure 25.—Post oak trees have invaded rangeland on Weatherford-Duffau complex, 3 to 8 percent slopes, eroded. This area was once cultivated. The brushy areas provide food and cover for wildlife.

Shallow range site. The Aledo and Purves soils (map units ByE, PvB, and SoC) are in this range site. The climax vegetation is a prairie of tall and mid grasses and many forbs. Live oak, elm, and hackberry rarely occur. The composition by weight is 95 percent grasses and 5 percent forbs.

Little bluestem is the dominant grass, producing 45 percent of the forage in climax condition. Indiangrass, big bluestem, switchgrass, sideoats grama, and tall dropseed make up 45 percent. Numerous other grasses make up the rest. More than 25 forbs are in this range site, including Engelmann-daisy, guara, Maxmilian sunflower, blacksamson, compass plant, heath aster, halfshrub sundrop, and native legumes.

As regression occurs because of overgrazing, big bluestem decreases rapidly, followed by indiangrass and switchgrass. If overgrazing continues, little bluestem, sideoats grama, and tall dropseed increase initially and then decrease. If abuse persists, vegetation is reduced to invaders, such as Texas grama, hairy tridens, tumblegrass, red threeawn, Hall panicum, curlycup gumweed, queensdelight, milkweed, nightshade, ragweed, gray goldaster, chalkhill woolywhite, mesquite, pricklypear, and yucca.

Shallow Clay range site. The Vernon soil (map unit VrC) is in this range site. The climax vegetation is a mid and short grass prairie and scattered woody plants. The composition by weight is 95 percent grasses and 5 percent forbs.

Sideoats grama is the dominant grass, producing 35 percent of the forage in climax condition. Cane, little bluestem, silver bluestem, vine mesquite, and buffalograss make up 40 percent. Other mid and short grasses, such as tall dropseed, Arizona cottontop, curly mesquite, and perennial threeawn make up the rest. Forbs include western ragweed, sageworth, dalea, bundleflower, Engelmann-daisy, and sensitivebriar. Woody species are ephedra, hackberry, and catclaw.

As regression occurs because of overgrazing, sideoats grama, silver bluestem, and vine mesquite decrease. These plants are replaced by buffalograss and curly mesquite. Continued abuse causes these grasses to lose their vigor and thin out. Eventually, with loss of cover, the site is invaded by annual grasses and forbs, mesquite, lotebush, juniper, pricklypear, and tasajillo.

Steep Abode range site. The Brackett soil (map unit ByE) is in this range site. The climax vegetation is tall and mid grasses and scattered live oak and Texas oak. The composition by weight is 85 percent grasses, 5 percent forbs, and 10 percent woody plants.

Little bluestem is the dominant grass, producing 30 percent of the forage in climax condition. Indiangrass, sideoats grama, and tall grama make up 30 percent. Other mid grasses, including hairy dropseed, silver bluestem, seep muhly, and rough tridens make up the rest. Forbs include wild alfalfa, bigtop dalea, white milkwort, trailing ratany, gayfeather, and queensdelight. Texas oak and live oak make up most of the woody production. Flameleaf sumac, skunkbush sumac, and redbud also occur.

Little bluestem, indiangrass, and sideoats grama are preferred species. As regression occurs because of overgrazing, these grasses decrease first. Tall dropseed, silver bluestem, and hairy grama initially increase. If abuse continues, Texas grama, threeawn, hairy tridens, red grama, and queensdelight increase or invade, or both. If the site is in poor condition, oak trees increase to create a dense canopy, and forage plants are reduced to almost nothing.

Tight Sandy Loam range site. The Keeter, Truce, and Windthrost soils (map units KtC, KtC3, TuB, TuC, TuC3, WtC, and WtC3) are in this range site. The climax vegetation is a mid grass, post oak, blackjack oak savanna. Oaks shade about 20 percent of the ground. The composition by weight is 75 percent grasses, 10 percent forbs, and 15 percent woody plants.

Sideoats grama and little bluestem are the dominant grasses, producing 35 percent of the forage in climax condition. Vine mesquite and Arizona cottontop produce 20 percent. Silver bluestem adds 5 percent. Other mid and short grasses, including Texas wintergrass, buffalograss, and blue grama, make up the rest. Forbs include western ragweed, sagewort, primrose, heath aster, and native legumes. Post oak, the most abundant woody plant, and blackjack oak produce 10 percent of the annual production. Bumelia, greenbrier, hackberry, plum, sumac, pricklyash, and lotebush also occur.

As regression occurs because of overgrazing, sideoats grama, vine mesquite, Arizona cottontop, and little bluestem decrease. Buffalograss, silver bluestem, and hairy grama increase initially. If abuse continues, tumble lovegrass, tumble windmillgrass, hairy tridens, Texas grama, oldfield threeawn, gummy lovegrass, curlycup gumweed, tasajillo, mesquite, juniper, and pricklypear invade. If this site is in poor condition, trees and shrubs dominate, and forage plants are reduced to almost nothing.

Table 7 lists plant species common to each range site in Wise County. Plant composition is expressed as a percentage of total production on an air-dry basis. In each column, percentages followed by the same letter are grouped together to equal the indicated percentage. Example: If three plants each are identified with a 10a percentage, the three plants together equal 10 percent of total composition in climax condition.

Recreation

Edward M. Schwille, biologist, Soil Conservation Service, helped prepare this section.

About 85 percent of the survey area is suited to commercial or noncommercial recreational activities. Lake Bridgeport and part of Eagle Mountain Lake, Black Creek Lake, and over 100 smaller lakes provide fishing and water-related activities. Some camping and picnic areas are also available, especially in the U.S. Forest Service's Lyndon B. Johnson National Grasslands. Several areas that are suited to recreational uses are along the West Fork of the Trinity River. Boating and fishing on the Trinity River provide many recreational opportunities. Existing water areas are abundant and range from 7 to over 100 acres. Limited accessibility reduces the potential for development of some scenic areas. White-tailed deer, bobwhite quail, Rio Grande turkey, and mourning dove inhabit the survey area. Several state historical markers and sites are in Wise County.

In table 8, the soils of the survey area are rated according to the limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have gentle slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes, stones, or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Wildlife Habitat

Edward M. Schwille, biologist, Soil Conservation Service, helped prepare this section.

As a result of management of the habitat, wildlife is increasing. Special consideration is being given by landowners to the improvement of habitat for game, nongame, and exotic species.

The main wildlife in the survey area are whitetailed deer, mourning dove, bobwhite quail, Rio Grande turkey, raccoon, opossum, striped skunk, bobcat, coyote, red and grey fox, armadillo, cottontail rabbits, fox squirrel, numerous songbirds, shorebirds, and raptors.

During the migration periods, waterfowl, such as mallard, pintail, and teal, use existing water areas. Some wood ducks are in the survey area. Fish, such as largemouth bass, channel catfish, crappie, sunfish, white bass, carp, gar, flathead catfish, and various minnows, are abundant in ponds, lakes, creeks, and rivers. Numerous reptiles and amphibians also thrive in this area.

The black-footed ferret is the only threatened and endangered specie that possibly lives in Wise County. During the migration period, bald and golden eagles have been sighted around Lake Bridgeport and Eagle Mountain Lake.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by stripcropping, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are grain sorghum, peanuts, corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are switchgrass, lovegrass, kleingrass, clover, winterpeas, vetch, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, wildrye, dropseed, sunflowers, sensitivebrier, and Engelmann-daisy.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are elbowbush, skunkbush sumac, greenbrier, blackberry, and plums.

Wetland plants are annual and perennial, wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, common reedgrass, sesbania, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, sloughs, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, mourning dove, meadowlark, numerous songbirds, cottontail, and coyote.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, raccoon, nutria, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include white-tailed deer, fox squirrel, wild turkey, bobwhite quail, and numerous songbirds.

Since wildlife is a product of the land, many areas in the county can be improved for use as habitat for wildlife. The productive, well-managed soils generally support vigorous wildlife populations; whereas infertile or eroded, poorly-managed soils generally support a sparse population. All parts of Wise County have areas that can be improved for use as habitat for wildlife.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations must be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to: evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. Depth to a high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, depth to a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost-action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, depth to a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and that good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, depth to a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, depth to a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, depth to a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* have significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and releases a variety of plant-available nutrients as it decomposes.

Water Management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives the restrictive features that affect each soil for terraces and diversions and for grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 17.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(1)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20, or higher, for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 17.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area, or from nearby areas, and on field examination.

Physical and Chemical Properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They influence the soil's adsorption of cations, moisture retention, shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of movement of water through the soil when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage in each major soil layer is stated in inches of water per inch of soil. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion. Losses are expressed in tons per acre per year. These estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur over a sustained period without affecting crop productivity. The rate is expressed in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 20 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 20 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 15, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflowing streams, by runoff from adjacent slopes, or by inflow from high tides. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in swamps and marshes or in a closed depreciation is considered ponding.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely to occur.

Frequency, duration, and probable dates of occurrence are estimated. Frequency generally is expressed as *none, rare, occasional,* or *frequent. None* means that flooding is not probable. *Rare* means that flooding is unlikely but possible under unusual weather conditions (there is a near 0 to 5 percent chance of flooding in any year). *Occasional* means that flooding occurs infrequently under normal weather conditions (there is a 5 to 50 percent chance of flooding in any year). *Frequent* means that flooding occurs often under normal weather conditions (there is more than a 50 percent chance of flooding in any year). *common* is used when classification as occasional or frequent does not affect interpretations. Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 days to 1 month), and *very long* (more than 1 month). The time of year that floods are most likely to occur is expressed in months. November-May, for example, means that flooding can occur during the period November through

May. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely, thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons, which are characteristic of soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table, that is, *perched, artesian*, or *apparent;* and the months of the year that the water table commonly is highest. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An *artesian* water table is under hydrostatic head, generally below an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

The two numbers in the "High water table-Depth" column indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that the water table exists for less than a month.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severely corrosive environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate*, or *high*. It is based on soil texture, acidity, and the amount of sulfates in the saturation extract.

Engineering Index Test Data

Table 17 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil Series and Their Morphology." The soil samples were tested by the Texas State Department of Highways and Public Transportation.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are: AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); Specific gravity (particle density)—T100 (AASHTO), D653 (ASTM); Shrinkage—T 92 (AASHTO), D 427 (ASTM).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(9)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or on laboratory measurements. Table 18 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders, primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Ustoll (*Ust*, meaning burnt, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Calciustolls (*Calc*, meaning lime, plus *ustoll*, the suborder of the Mollisols that have a ustic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Calciustolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, thermic Typic Calciustolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. There can be some variation in the texture of the surface layer or of the substratum within a series. An example is the Venus series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual (7)*. Many of the technical terms used in the descriptions are defined in *Soil Taxonomy (9)*. Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Aledo Series

The Aledo series consists of shallow and very shallow, loamy and gravelly soils on uplands. The soils formed in fractured limestone bedrock (fig. 26). Slope ranges from 1 to 20 percent.

Typical pedon of Aledo gravelly loam, in an area of Somervell-Aledo complex, 1 to 8 percent slopes; from U.S. Highway 380 in northeast Decatur, 6 miles northeast on Farm Road 51, 4.7 miles east on a county road, 0.1 mile northeast on a ranch road, and 50 feet south of the road, in rangeland:

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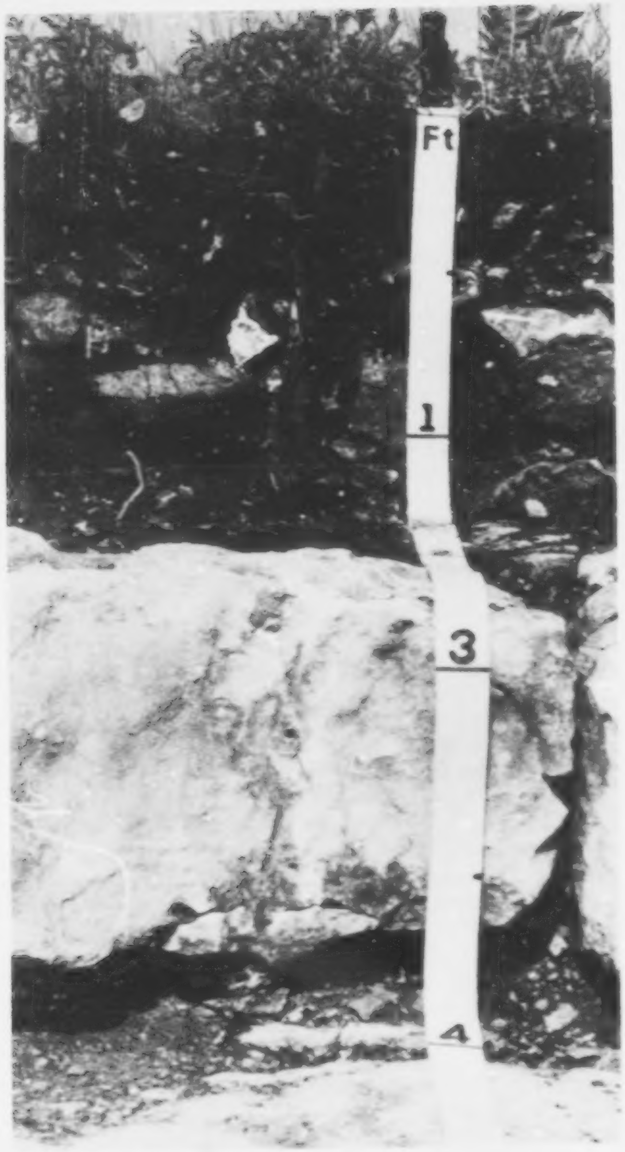

Figure 26.—Aledo gravelly loam is underlain by fractured limestone at a depth of about 18 inches.

A1—0 to 4 inches; dark brown (10YR 4/3) gravelly loam, dark brown (10YR 3/3) moist; strong fine granular structure; hard, friable; many fine roots and few large roots; common wormcasts; few snail shell fragments; about 20 percent, by volume, weathered fossil shells and fragments of limestone as much as 3 inches across; about 5 percent, by volume, fragments of limestone 3 to 8 inches across; calcareous, moderately alkaline; clear irregular boundary.

A2—4 to 18 inches; dark brown (10YR 4/3) very gravelly loam, dark brown (10YR 3/3) moist; strong fine and medium granular structure; hard, friable; common fine and medium roots; common wormcasts; few snail shell fragments; about 65 percent, by volume, weathered fossil shells and fragments of limestone mostly less than 6 inches across; calcareous, moderately alkaline; abrupt wavy boundary.

R—18 to 24 inches; indurated coarsely fractured limestone interbedded with layers of weakly cemented limestone and marl; roots and soil material in fractures.

Thickness of the solum and depth to hard, coarsely fractured limestone range from 6 to 20 inches. Content of limestone and shell fragments ranges from 15 to 30 percent in the A1 horizon and from 40 to 80 percent in the A2 horizon. The fragments are mostly less than 6 inches across. The calcium carbonate equivalent throughout the solum ranges from 40 to 80 percent.

The A horizon is grayish brown, dark grayish brown, very dark grayish brown, or dark brown. It is gravelly loam, very gravelly loam, or very gravelly clay loam.

The R layer is coarsely fractured, indurated limestone. It is interbedded with layers of weakly cemented limestone, marl, and loamy soil material. This layer can be cut in most places with conventional ripping equipment.

Anocon Series

The Anocon series consists of deep, loamy soils on gently sloping uplands. The soils formed in loamy sediment. Slope ranges from 2 to 5 percent.

Typical pedon of Anocon loam, 2 to 5 percent slopes; from Texas Highway 114 in Bridgeport, 8.5 miles southwest on Farm Road 920, 0.5 mile southeast on a private ranch road, and 200 feet southwest, in rangeland:

A—0 to 7 inches; dark brown (7.5YR 4/2) loam, dark brown (7.5YR 3/2) moist; weak fine granular and weak very fine subangular blocky structure; hard, friable; many fine and medium roots; few fine pores; common wormcasts and worm channels; few fine black concretions; neutral; clear wavy boundary.

AB—7 to 13 inches; reddish brown (5YR 4/3) loam, dark reddish brown (5YR 3/3) moist; moderate coarse prismatic structure parting to weak fine subangular blocky; hard, friable; many fine and medium roots; common fine and medium pores; common wormcasts and channels; common distinct clay films; few black concretions; neutral; gradual wavy boundary.

Bt1—13 to 18 inches; reddish brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) moist; moderate fine subangular blocky structure; very hard, firm; common fine and medium roots; few fine pores; few wormcasts; common distinct clay films; few black concretions; few siliceous pebbles; neutral; clear wavy boundary.

Bt2—18 to 32 inches; brown (7.5YR 5/4) clay, dark brown (7.5YR 4/4) moist; common medium distinct reddish yellow (5YR 6/6) mottles; yellowish brown (10YR 5/4) coatings on faces of peds; moderate medium blocky structure; extremely hard, very firm, sticky and plastic; many thick clay films; few black concretions 1 to 5 millimeters in diameter; neutral; diffuse wavy boundary.

Bt3—32 to 56 inches; strong brown (7.5YR 5/6) clay, dry and moist; few fine distinct reddish yellow mottles; moderate medium blocky structure; extremely hard, very firm, sticky and plastic; few fine roots; many thick clay films one chroma less than soil matrix; few black concretions 1 to 3 millimeters in diameter; few fine and medium concretions of calcium carbonate below 44 inches; mildly alkaline; gradual wavy boundary.

BC—56 to 70 inches; reddish yellow (7.5YR 6/6) clay loam, strong brown (7.5YR 5/6) moist; common medium distinct yellowish red (5YR 5/8) and very pale brown (10YR 7/3) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; very hard, firm; few fine roots; few fine pores; thick reddish brown clay film coatings on prism faces; few black masses and concretions; few fine and medium concretions of calcium carbonate; noncalcareous, moderately alkaline.

The solum ranges from 60 to 80 inches in thickness. Concretions and masses of calcium carbonate are below a depth of 28 inches.

The A horizon is brown, dark brown, dark reddish brown, or reddish brown loam. Reaction is slightly acid or neutral. The mollic epipedon is 10 to 20 inches thick and includes the A and AB horizons, and in places, the Bt1 horizon.

The Bt horizon is reddish brown, brown, strong brown, yellowish brown, brownish yellow, or reddish yellow. Mottles of these colors range from none to common and from faint to distinct. Grayish mottles are below a depth of 30 inches in some pedons. The texture is clay loam or clay. Clay content of the control section averages from 35 to 45 percent. Reaction is neutral or mildly alkaline.

The BC horizon is reddish yellow, yellowish red, brown, or is mottled in shades of red, yellow, or brown. Texture is sandy clay loam or clay loam. A few calcium carbonate concretions and soft masses are in most pedons. Reaction is mildly alkaline or moderately alkaline.

Balsora Series

The Balsora series consists of deep, loamy soils on flood plains. The soils formed in recent loamy alluvium. Slope is 0 to 1 percent.

Typical pedon of Balsora silt loam, frequently flooded; from Texas Highway 114 in Paradise, about 200 feet northeast on Farm Road 3259, 0.2 mile northwest on a county road, 1.85 miles north, 0.58 mile east on a county road, and 100 feet south of road, on flood plain of West Fork of Trinity River:

Ap—0 to 6 inches; yellowish brown (10YR 5/4) silt loam, dark yellowish brown (10YR 4/4) moist; moderate medium granular and moderate fine subangular blocky structure; hard, friable; common fine and medium roots; neutral; abrupt smooth boundary.

C1—6 to 33 inches; stratified brown (10YR 5/3) and light yellowish brown (10YR 6/4) silt loam, dark brown (10YR 4/3) and yellowish brown (10YR 5/4) moist; massive; common thin bedding planes and few 1- to 3-inch strata of very fine sandy loam; hard, friable; common fine and medium roots; few thin calcareous strata; mildly alkaline; clear smooth boundary.

C2—33 to 52 inches; dark brown (10YR 4/3) silty clay loam, dark brown (10YR 3/3) moist; massive; common 1- to 3-inch strata of light yellowish brown (10YR 6/4) loam and silt loam that have common bedding planes; very hard, firm; few fine roots, few fine pores; few thin calcareous strata; mildly alkaline; abrupt smooth boundary.

Ab—52 to 64 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate medium blocky structure; very hard, very firm, sticky and plastic; few fine roots; few lenses of loamy material; mildly alkaline.

The 10- to 40-inch control section is silt loam, loam, silty clay loam, or clay loam that is distinctly or prominently stratified with one or more of these textures and thin lenses of very fine sandy loam or silty clay. The weighted average clay content ranges from 18 to 35 percent. Less than 15 percent of the sand content is coarser than very fine sand. The soil ranges from slightly acid to moderately alkaline. Interbedded strata of noncalcareous and calcareous material are common. Typically, the surface layer is noncalcareous.

The A or Ap horizon is grayish brown, dark grayish brown, brown, yellowish brown, or dark yellowish brown. Texture is silt loam or silty clay. This horizon is 4 to 12 inches thick.

The C horizon is dark grayish brown, grayish brown, brown, dark brown, dark yellowish brown, yellowish brown, light yellowish brown, pale brown, light brownish gray, or very pale brown. Some pedons have thin strata of very dark grayish brown or dark brown, and some pedons have a few brownish mottles. Texture is dominantly silt loam, loam, clay loam, or silty clay loam stratified with thin lenses of very fine sandy loam or silty clay.

A buried horizon is typically below a depth of 40 inches. It is dark gray, grayish brown, or dark grayish brown silty clay loam or silty clay. Some pedons do not have a buried horizon.

Bastsil Series

The Bastsil series consists of deep, loamy and sandy soils on uplands. The soils formed in ancient loamy terrace alluvium. Slope ranges from 0 to 3 percent.

Typical pedon of Bastsil fine sandy loam, 0 to 3 percent slopes; from Farm Road 730 in east Boyd, 2.5 miles east on Texas Highway 114, 2.5 miles south on Farm Road 718, 0.75 mile west on a county road, 1 mile south, 0.25 mile east, 0.25 mile south, and 150 feet west:

Ap—0 to 9 inches; light brown (7.5YR 6/4) fine sandy loam, dark brown (7.5YR 4/4) moist; weak fine granular and weak fine subangular blocky structure; slightly hard, very friable; common fine and medium roots; few wormcasts; few rounded siliceous pebbles up to 1 centimeter in diameter; slightly acid; abrupt smooth boundary.

E—9 to 15 inches; brown (7.5YR 5/4) fine sandy loam, dark brown (7.5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, very friable; common fine and medium roots; many fine and medium pores; few wormcasts; few rounded siliceous pebbles up to 1 centimeter in diameter; slightly acid; gradual smooth boundary.

Bt1—15 to 38 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate coarse prismatic structure parting to weak medium subangular blocky; very hard, friable; common fine roots; many fine and medium pores; few wormcasts and channels; many clay films 1 chroma less than soil matrix; slightly acid; gradual smooth boundary.

Bt2--38 to 69 inches; red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) moist; moderate coarse prismatic structure parting to weak medium subangular blocky; hard, friable; few fine roots; common fine and medium pores; many clay films one chroma less than soil matrix; few fine dark masses; slightly acid; gradual smooth boundary.

B/E—69 to 80 inches; red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, friable; few fine roots; many clay films on faces of prisms one chroma less than soil matrix; few light brownish gray (10YR 6/2) clay flows; common streaks of light gray (10YR 7/2) uncoated sand grains; few dark masses 2 to 5 millimeters in diameter; slightly acid.

The solum ranges from 60 to more than 80 inches in thickness. Clay content in the control section is 20 to 35 percent.

The A horizon is reddish brown, pink, light brown, or brown fine sandy loam or loamy fine sand. Rounded, siliceous pebbles range from few to common. Reaction is slightly acid or neutral.

The E horizon is brown, light brown, or yellowish red loamy fine sand or fine sandy loam. Rounded siliceous pebbles range from few to common. Reaction is slightly acid or neutral. Combined thickness of the A and E horizons ranges from 8 to 20 inches.

The Bt horizon is strong brown, reddish brown, red, light red, reddish yellow, or yellowish red sandy clay loam. Reaction ranges from medium acid to neutral.

The B/E horizon has reddish or brownish matrix colors. Grayish clay films are few to common. Grayish uncoated sand and silt particles range from few to common and are on the surface of peds and in streaks and pockets. Texture is sandy clay loam that has none to common rounded, siliceous pebbles. Reaction is medium acid to neutral.

Blanket Series

The Blanket series consists of deep, loamy soils on uplands. The soils formed in colluvium on foot slopes. Slope ranges from 1 to 3 percent.

Typical pedon of Blanket clay loam, 1 to 3 percent slopes; from U.S. Highway 81 in Decatur, 0.55 mile west on U.S. Highway 380, and 650 feet north, in a cultivated field:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) moist; moderate fine subangular blocky and moderate fine granular structure; very hard, firm, sticky and plastic; common fine and medium roots; few wormcasts; mildly alkaline; abrupt smooth boundary.

A—8 to 18 inches; very dark grayish brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure; very hard, firm, sticky and plastic; common fine and medium roots; few wormcasts; few fine and medium pores; mildly alkaline; gradual smooth boundary.

Bt1—18 to 25 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate fine and medium blocky structure; extremely hard, very firm, sticky and plastic, few fine and medium roots; few wormcasts; common thin clay films on faces of peds; mildly alkaline; gradual smooth boundary.

Bt2—25 to 30 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium blocky structure; extremely hard, firm, sticky and plastic; few fine roots; few wormcasts; common distinct clay films on faces of peds; mildly alkaline; gradual smooth boundary.

Bt3—30 to 41 inches; dark brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate medium blocky structure; very hard, firm, sticky and plastic; few fine roots; few wormcasts; common distinct clay films on faces of peds; mildly alkaline; gradual smooth boundary.

Bk—41 to 62 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium blocky structure; very hard, firm, sticky and plastic; few fine roots; many distinct clay films on faces of peds; many threads and few concretions of calcium carbonate; few fine dark concretions; calcareous, moderately alkaline; diffuse wavy boundary.

BCk—62 to 80 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; hard, firm, sticky; few fine roots; many threads, soft masses, and concretions of calcium carbonate; few dark concretions as much as 6 millimeters in diameter; calcareous, moderately alkaline.

The solum ranges from 60 to 80 inches in thickness. Concretions and threads of calcium carbonate are below 28 inches. The mollic epipedon includes all of the A horizon and part, or all, of the Bt horizon.

The A horizon is dark brown, very dark brown, very dark grayish brown, or dark grayish brown clay loam. Reaction is neutral or mildly alkaline. Thickness ranges from 8 to 20 inches.

The Bt horizon is dark brown, dark grayish brown, or brown. Texture is clay loam, silty clay, or clay. The clay content ranges from 35 to 50 percent. Reaction is neutral to moderately alkaline.

The Bk and BCk horizons are brown, light brown, pale brown, or very pale brown. Some pedons have mottles in shades of brown and yellow. Texture is clay loam, and some pedons have strata of loam or sandy clay loam. Reaction is moderately alkaline and calcareous. The BCk horizon is more than 20 percent visible films, threads, soft masses, or concretions of calcium carbonate.

Bolar Series

The Bolar Series consists of moderately deep, loamy soils on uplands. The soils formed in interbedded, fractured limestone and marly clay (fig. 27). Slope ranges from 1 to 5 percent.

Typical pedon of Bolar clay loam, 1 to 3 percent slopes; from Farm Road 730 in Decatur, 10.6 miles southeast on U.S. Highway 81, 4.5 miles east on Farm Road 407 to Wise-Denton county line, 2,700 feet north along the county line, and 150 feet west of the county line:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky and moderate fine granular structure; very hard, firm, sticky and plastic; common fine and medium roots; common wormcasts and channels; common very fine and fine weathered limestone fragments; common snail shell fragments; calcareous, moderately alkaline; clear smooth boundary.

A—7 to 12 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist;

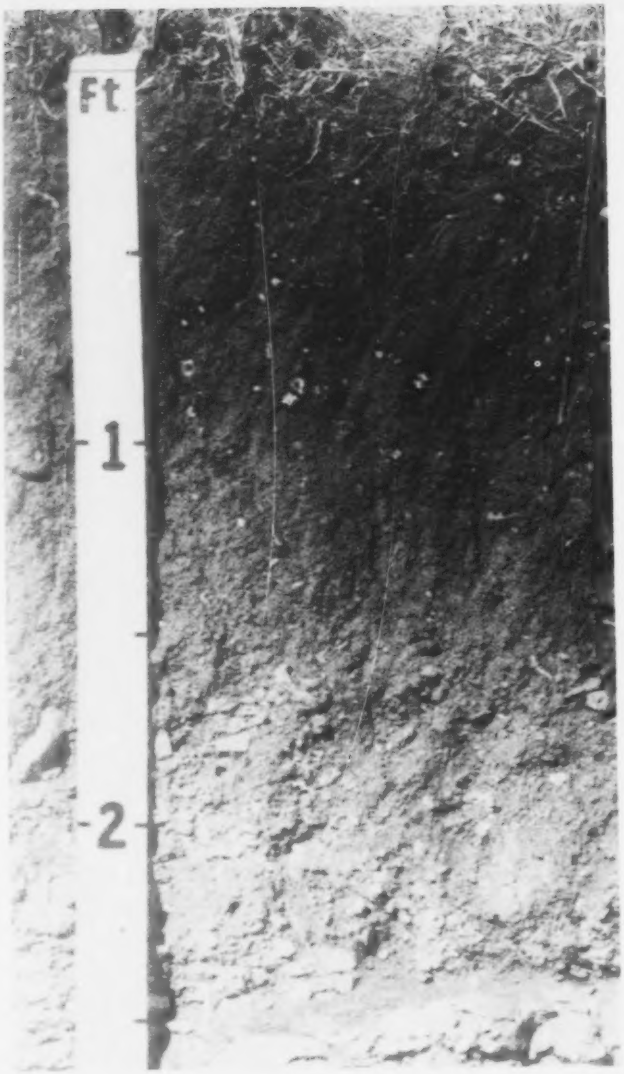

Figure 27.—Bolar clay loam formed in interbedded fractured limestone and marl. Bolar soils have limestone fragments throughout the profile.

moderate very fine and fine blocky structure; very hard, firm, sticky and plastic; common fine roots; common very fine pores; common wormcasts color of horizons below; common very fine concretions of calcium carbonate; common weathered limestone fragments mainly less than 1 centimeter across; few snail shell fragments; calcareous, moderately alkaline; gradual smooth boundary.

Bk1—12 to 25 inches; light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; moderate very fine and fine blocky structure; very hard, firm; common fine roots; common fine pores; few wormcasts; common fine and medium concretions of calcium carbonate; few powdery calcium carbonate masses; common weathered limestone fragments mainly less than 1 inch across, few fragments as much as 4 inches across; calcareous, moderately alkaline; gradual smooth boundary.

Bk2—25 to 32 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; moderate very fine and fine blocky structure; hard, firm; few fine roots; few very fine pores; few wormcasts; many medium and coarse powdery calcium carbonate masses; common fine and medium calcium carbonate concretions; common weathered limestone fragments mainly less than 1 inch across, few fragments as much as 5 inches across; calcareous, moderately alkaline; gradual irregular boundary.

R—32 to 47 inches; indurated and soft fractured limestone interbedded with stratified light yellowish brown (2.5Y 6/4) marly clay and shale, light olive brown (2.5Y 5/4) moist; marly clay and shale have common medium distinct yellow (10YR 7/6) and brownish yellow (10YR 6/6) mottles; distinct bedding planes; few roots penetrate fractures; many soft powdery calcium carbonate masses; common fine black concretions; calcareous.

The solum is 20 to 40 inches thick. Scattered fragments of limestone range from a few to 35 percent, by volume, below the A horizon. Calcium carbonate equivalent below 10 inches and to the R layer exceeds 40 percent. The soil is calcareous and moderately alkaline throughout. Silicate clay content of the control section is 20 to 35 percent.

The A horizon is dark grayish brown, grayish brown, dark brown, or brown clay loam. It is 7 to 20 inches thick.

The Bk horizon is brown, light brown, very pale brown, pale brown, grayish brown, light brownish gray, light gray, light yellowish brown, light olive brown, or pale yellow. The texture is loam, clay loam, or silty clay loam.

The R layer is interbedded fractured limestone and marly clay. Some pedons have thin layers of fractured chalk and shale.

Bonti Series

The Bonti series consists of moderately deep, loamy soils on uplands. The soils formed in beds of sandstone. Slope ranges from 1 to 8 percent.

Typical pedon of Bonti stony fine sandy loam, in an area of Bonti-Exray complex, stony, 1 to 8 percent slopes; from Texas Highway 101 in Bridgeport, 6.9 miles west on U.S. Highway 380, 0.95 mile south and west on Port-O-Call Drive in Runaway Bay, and 150 feet north of road:

A—0 to 5 inches; brown (10YR 5/3) stony fine sandy loam, dark brown (10YR 4/3) moist; weak fine subangular blocky and weak fine granular structure; slightly hard, very friable; many fine and medium roots; sandstone fragments 3 to 15 inches across on about 3 percent of surface and imbedded in horizon; slightly acid; clear smooth boundary.

E—5 to 11 inches; light yellowish brown (10YR 6/4) stony fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky and weak granular structure; slightly hard, very friable; many fine and medium roots; about 5 percent, by volume, sandstone fragments 3 to 15 inches across; slightly acid; clear smooth boundary.

Bt1—11 to 22 inches; yellowish red (5YR 5/6) clay, yellowish red (5YR 4/6) moist; moderate fine blocky structure; very hard, firm; common fine and medium roots; many thick reddish brown (5YR 4/4) clay films on faces of peds; few sandstone fragments 1/2 inch to 5 inches across; medium acid; gradual smooth boundary.

Bt2—22 to 30 inches; red (2.5YR 5/6) clay, red (2.5YR 4/6) moist; few medium distinct strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) mottles; moderate fine blocky structure; very hard, firm; common fine and medium roots; common distinct reddish brown (5YR 5/4) clay films on faces of peds; few sandstone fragments; strongly acid; clear smooth boundary.

R—30 to 36 inches; yellow (10YR 8/6) strongly cemented and coarsely fractured sandstone, brownish yellow (10YR 6/6) moist; reddish brown clay flows and roots in fractures; strongly acid.

Thickness of the solum and depth to sandstone range from 20 to 40 inches. Sandstone fragments in the A and E horizons range from 0 to 15 percent, by volume. They range from 1/8 inch to 24 inches across their long axis.

The A horizon is brown, yellowish brown, or dark yellowish brown fine sandy loam or stony fine sandy loam. Reaction is slightly acid or neutral. The thickness ranges from 2 to 6 inches.

The E horizon is brown, light yellowish brown, or light brown fine sandy loam or stony fine sandy loam.

Reaction is slightly acid or neutral. The thickness ranges from 1 to 6 inches.

The Bt1 horizon is red, yellowish red, reddish brown, or light reddish brown clay, clay loam, or sandy clay. Reaction is strongly acid or medium acid. Clay content ranges from 35 to 50 percent.

The Bt2 horizon is red, yellowish red, or reddish brown and has dark red, reddish yellow, strong brown, or yellowish brown mottles. The texture is clay, clay loam, or sandy clay that has none to common fragments of weathered sandstone. Reaction is strongly acid or medium acid.

The R layer is strongly cemented brownish, yellowish, or pinkish white sandstone that has a few fractures. Fractures are coated with clay flows.

Brackett Series

The Brackett series consists of deep, loamy soils on uplands. The soils formed in interbedded limestone, limy earth, and marl (fig. 28). Slope ranges from 5 to 20 percent.

Typical pedon of Brackett gravelly loam, in an area of Brackett-Aledo complex, 5 to 20 percent slopes; from U.S. Highway 81 in Decatur, 0.25 mile north on Farm Road 730, and 300 feet west of road:

A—0 to 6 inches; light yellowish brown (2.5Y 6/4) gravelly loam, olive brown (2.5Y 4/4) moist; strong very fine subangular blocky structure; hard, very friable; many fine and medium roots; common fine and medium pores; common wormcasts; about 15 percent, by volume, limestone and shell fragments up to 1 centimeter across; calcareous, moderately alkaline; gradual smooth boundary.

Bw—6 to 18 inches; pale yellow (2.5Y 7/4) loam, light olive brown (2.5Y 5/4) moist; moderate very fine subangular blocky structure; hard, very friable; common fine and medium roots; few fine pores; common wormcasts mostly color of surface layer; common fine concretions of calcium carbonate; common shell and limestone fragments up to 1 centimeter across; few bands weathered chalk fragments in lower part; calcareous, moderately alkaline; diffuse irregular boundary.

C—18 to 40 inches; thinly to coarsely bedded, light gray and pale yellow limy earth that has bands of mottled light gray, pale yellow, and yellowish brown silty marl and thin bands of fractured limestone; cleavage planes in the limestone and silty marl; few roots in upper part and between limestone fractures; few soft powdery calcium carbonate masses; calcareous, moderately alkaline.

The solum ranges from 14 to about 30 inches in thickness. Content of weathered shell and limestone fragments range from 5 to 35 percent. Fragments are mainly less than 3 inches across. Calcium carbonate equivalent of the solum and C horizon ranges from 40 to 80 percent.

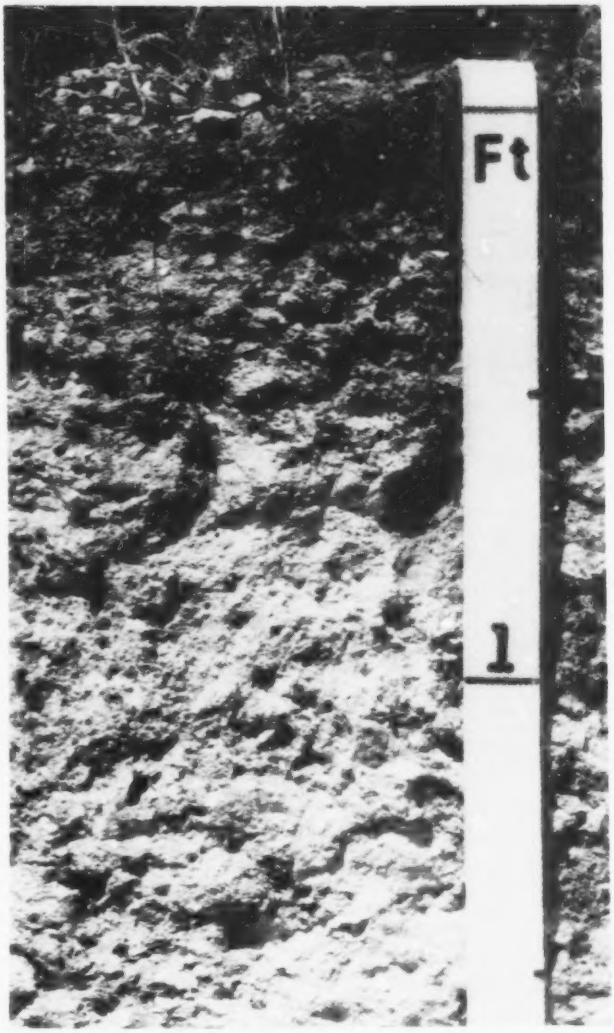

Figure 28.—Brackett gravelly loam has limestone and shell fragments throughout the solum.

The A horizon is grayish brown, brown, light grayish brown, pale brown, light yellowish brown, very pale brown, or light gray gravelly loam. It is 4 to 12 inches thick.

The Bw horizon is pale brown, light gray, light brownish gray, or pale yellow. It is loam, gravelly loam, clay loam, or gravelly clay loam.

The C horizon is very pale brown, pale yellow, white, light brownish gray, or light gray. Yellowish brown mottles are in some strata. The texture is stratified silty shale, marl, and limy earth. Fractured limestone and chalk bands, mainly less than 2 inches thick, are as much as 50 percent of the volume.

Chaney Series

The Chaney series consists of deep, sandy soils on uplands. The soils formed in loamy sediment. Slope ranges from 1 to 4 percent.

Typical pedon of Chaney loamy fine sand, 1 to 4 percent slopes; from Texas Highway 101 in Chico, 0.12 mile east on Farm Road 1810, 0.85 mile north on a county road, 0.75 mile east, 1.30 miles north, and 120 feet east of the road:

Ap—0 to 6 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 4/3) moist; weak fine granular structure; slightly hard, very friable; common fine roots; few rounded siliceous pebbles less than 1 centimeter in diameter; slightly acid; clear smooth boundary.

E—6 to 12 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; weak fine granular structure; slightly hard, very friable; common fine roots and pores: few rounded siliceous pebbles less than 1 centimeter in diameter; slightly acid; abrupt smooth boundary.

Bt1—12 to 24 inches; yellowish brown (10YR 5/6) sandy clay, yellowish brown (10YR 5/4) moist; common medium prominent dark red (2.5YR 3/6) and common fine distinct reddish yellow (7.5YR 6/8) and grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; very hard, very firm; common fine roots; few fine pores; common distinct clay films on faces of peds; slightly acid; gradual smooth boundary.

Bt2—24 to 40 inches; brownish yellow (10YR 6/6) sandy clay, yellowish brown (10YR 5/6) moist; common medium distinct red (2.5YR 4/6), yellowish red (5YR 5/6), and light gray (10YR 7/2) mottles; moderate medium subangular blocky structure; very hard, very firm; few fine roots and pores; common distinct clay films on faces of peds; neutral; gradual smooth boundary.

Bt3—40 to 46 inches; brownish yellow (10YR 6/6) sandy clay loam, yellowish brown (10YR 5/6) moist; many coarse distinct red (2.5YR 4/6) and light gray (10YR 7/2) mottles; moderate medium prismatic structure parting to weak fine and medium blocky; very hard, firm; few fine roots; common thick pale brown clay flows on faces of prisms; few concretions of calcium carbonate; mildly alkaline; clear smooth boundary.

C—46 to 72 inches; light gray (2.5Y 7/2) sandy clay loam interbedded with shaly and clayey material, light brownish gray (2.5Y 6/2) moist; common medium distinct red (2.5YR 4/6) and brownish yellow (10YR 6/6) mottles; massive; very hard, firm; few fine roots; few concretions of calcium carbonate; noncalcareous, moderately alkaline.

The solum ranges from 40 to 60 inches in thickness.

The A horizon is light brownish gray, grayish brown, pale brown, brown, or light yellowish brown loamy fine sand.

The E horizon is grayish brown, light brownish gray, brown, pale brown, very pale brown, or light yellowish brown loamy fine sand. The A and E horizons are slightly acid or neutral. Combined thickness is 6 to 20 inches.

The Bt1 and Bt2 horizons are reddish brown, red, dark red, yellowish red, yellow, reddish yellow, strong brown, yellowish brown, or brownish yellow. In most pedons, these horizons are mottled in various amounts of red, yellow, brown, and gray. The texture is sandy clay or clay. Clay content ranges from 35 to 50 percent. Reaction is medium acid to neutral. The Bt3 horizon is mottled in brownish yellow, red, pale brown, light gray, or gray. The texture is sandy clay loam or sandy clay. Reaction is medium acid to moderately alkaline.

The C horizon ranges from sandy clay loam to shaly clay. Reaction is medium acid to moderately alkaline. Some pedons have a few films, threads, or soft masses of calcium carbonate.

Cisco Series

The Cisco series consists of deep, sandy soils on uplands. The soils formed in loamy sediment. Slope ranges from 1 to 3 percent.

Typical pedon of Cisco loamy sand, 1 to 3 percent slopes; from U.S. Highway 81 in Decatur, 8.6 miles west on Farm Road 1810, 0.9 mile north on Farm Road 1655, 0.4 mile west on a county road, and 600 feet north:

Ap—0 to 8 inches; light yellowish brown (10YR 6/4) loamy sand, yellowish brown (10YR 5/4) moist; single grained; loose; few fine roots; neutral; clear wavy boundary.

A—8 to 13 inches; light brown (7.5YR 6/4) loamy sand, brown (7.5YR 5/4) moist; single grained; loose; few fine roots; neutral; clear smooth boundary.

Bt1—13 to 28 inches; yellowish red (5YR 4/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak fine and medium subangular blocky structure; very hard, firm; few fine roots; common distinct clay films 1 chroma less than soil matrix; neutral; gradual smooth boundary.

Bt2—28 to 40 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 5/6) moist; weak fine and medium subangular blocky structure; hard, firm; few fine roots; common distinct clay films 1 chroma less than soil matrix; slightly acid; gradual smooth boundary.

BC—40 to 48 inches; reddish yellow (7.5YR 6/6) fine sandy loam, strong brown (7.5YR 5/6) moist; weak fine subangular blocky structure; slightly hard, friable; few fine roots; common bridged sand grains, few rounded siliceous pebbles less than 1 inch in diameter; slightly acid; gradual smooth boundary.

C—48 to 60 inches; very pale brown (10YR 7/4) loamy sand, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable; common weakly cemented masses; few rounded siliceous pebbles up to 1 inch in diameter; mildly alkaline.

The solum ranges from 40 to 70 inches in thickness. A few rounded siliceous pebbles are in the solum.

The A horizon is brown, light brown, pale brown, yellowish brown, or light yellowish brown loamy sand. Reaction is slightly acid or neutral. This horizon ranges from 6 to 18 inches in thickness.

The Bt horizon is reddish brown, yellowish red, or red sandy clay loam. Clay content ranges from 20 to 35 percent. Reaction is slightly acid or neutral.

The BC horizon is yellowish red, reddish yellow, or red fine sandy loam or sandy clay loam. Reaction is slightly acid to moderately alkaline.

The C horizon is fine sandy loam, sandy clay loam, or weakly cemented packsand in shades of brown, yellow, or red. Reaction is mildly alkaline.

Cona Series

The Cona series consists of deep, loamy and stony soils on uplands. The soils formed in shaly clay or weakly cemented sandstone. Slope ranges from 3 to 12 percent.

Typical pedon of Cona very stony sandy loam, 3 to 12 percent slopes; from Farm Road 1810 in Chico, 8.5 miles north on Texas Highway 101, 2.1 miles west on a county road, and 350 feet south, in a wooded area:

A—0 to 5 inches; brown (10YR 5/3) very stony sandy loam, dark brown (10YR 4/3) moist; weak fine subangular blocky and weak fine granular structure; slightly hard, very friable; many fine and medium roots; common fine pores; about 20 percent, by volume, rounded siliceous pebbles mainly less than 1 inch in diameter; sandstone or conglomerate stones as much as 30 inches thick and 60 inches across on about 15 percent of surface; stones imbedded in horizon; neutral; clear wavy boundary.

E—5 to 9 inches; pale brown (10YR 6/3) very stony sandy loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, very friable; common fine and medium roots; common fine pores; about 20 percent, by volume, rounded siliceous pebbles mainly less than 1 inch in diameter; imbedded stones extend above surface; slightly acid; abrupt wavy boundary.

Bt1—9 to 22 inches; red (2.5YR 4/6) clay, dark red (2.5YR 3/6) moist; moderate coarse blocky structure; extremely hard, very firm, sticky and plastic; few fine roots; many thick clay films on faces of peds; common pressure faces; common rounded siliceous pebbles as much as 1 inch in diameter; strongly acid; gradual wavy boundary.

Bt2—22 to 32 inches; reddish yellow (7.5YR 6/6) clay, strong brown (7.5YR 5/6) moist; common medium distinct red (2.5YR 4/6) mottles; moderate medium blocky structure; extremely hard, very firm, sticky and plastic; few fine roots; common distinct clay films on faces of peds; few rounded siliceous pebbles as much as 1 inch in diameter; few fine dark concretions; common pressure faces; medium acid; diffuse wavy boundary.

BC—32 to 39 inches; brownish yellow (10YR 6/6) clay, yellowish brown (10YR 5/6) moist; weak medium blocky structure; extremely hard, very firm, sticky and plastic; few fine roots; few clay films on faces of peds; few dark concretions; common pressure faces; few weathered shale fragments; neutral; diffuse wavy boundary.

C—39 to 60 inches; distinctly mottled brownish yellow (10YR 6/6) and reddish brown (5YR 5/4) shaly clay, yellowish brown (10YR 5/6) and reddish brown (5YR 4/4) moist; few fine distinct light gray mottles; rock structure parting to weak platy and blocky; extremely hard, very firm; few fine roots; few fine and medium concretions of calcium carbonate; few dark concretions and masses; mildly alkaline.

The solum ranges from 20 to 40 inches in thickness. Clay content in the control section ranges from 35 to 45 percent. Fragments of sandstone conglomerate or sandstone cover 5 to 20 percent of the surface. Most of the fragments are 10 to 30 inches across their long axis, but some are much larger.

The A horizon is brown or dark grayish brown. The E horizon is light brown, very pale brown, or pale brown. These horizons are very stony sandy loam. Siliceous and sandstone pebbles range from a few to 35 percent, by volume. Conglomerate and sandstone fragments 6 to 60 inches across make up 5 to 30 percent of these horizons. Reaction is slightly acid or neutral. Combined thickness of the A and E horizons ranges from 3 to 10 inches.

The Bt horizon is red, reddish yellow, or yellowish red. The Bt2 horizon is mottled in shades of red, yellow, and brown. Siliceous or sandstone pebbles, cobbles, and stones range from none to about 8 percent, by volume. The texture is clay or sandy clay. Reaction is strongly acid or medium acid.

The BC and C horizons are shades of yellow, brown, or gray. Some pedons are mottled in shades of red, yellow, brown, or gray. The texture is clay, shaly clay, or sandy clay. Strata of loamy material are in some pedons. Reaction ranges from medium acid to mildly alkaline. Some pedons have a few concretions of calcium carbonate.

Darnell Series

The Darnell series consists of shallow, loamy and stony soils on uplands. The soils formed in thick beds of sandstone. Slope ranges from 5 to 20 percent.

Typical pedon of Darnell very stony fine sandy loam, in an area of Darnell-Exray complex, very stony, 5 to 20 percent slopes; from Texas Highway 101 in Bridgeport, 8.6 miles west on U.S. Highway 380, 0.4 mile north and east on Runaway Bay Drive, 0.2 mile north, 0.2 mile east on oil field road, and 300 feet south of road, on a wooded hillside:

A—0 to 3 inches; brown (10YR 5/3) very stony fine sandy loam; dark brown (10YR 3/3) moist; weak fine and medium granular structure; slightly hard, very friable; many fine and medium roots; few fine pores; angular stones 3 to 60 inches across and 3 to 30 inches thick on about 3 to 15 percent of the surface; stones imbedded in horizon; slightly acid; clear smooth boundary.

Bw—3 to 11 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; weak fine subangular blocky structure; slightly hard, very friable; common fine and medium roots; few fine pores; few imbedded stones; common fragments of partly weathered weakly cemented sandstone in lower part; slightly acid; clear irregular boundary.

Cr—11 to 14 inches; light brown (7.5YR 6/4) sandstone; moderately cemented when dry, weakly cemented when moist; slightly acid.

Thickness of the solum and depth to sandstone bedrock range from 10 to 20 inches.

The A horizon is dark grayish brown, brown, dark brown, or yellowish brown very stony fine sandy loam. Content of fragments, 3 to 60 inches across, ranges from 3 to 15 percent, by volume. Reaction is slightly acid or neutral.

The Bw horizon is brown, yellowish brown, light brown, light yellowish brown, very pale brown, or yellow. Texture is fine sandy loam or gravelly fine sandy loam. Content of fragments range from 0 to 20 percent, by volume. Coarse fragments less than 3 inches across range from 0 to 15 percent, by volume, and coarse fragments more than 3 inches across range from 0 to 5 percent, by volume. Reaction is slightly acid or neutral.

The Cr horizon is weakly to strongly cemented sandstone that can be cut with a spade or auger. It is yellowish red, light brown, brownish yellow, or yellowish brown. Reaction is slightly acid or neutral.

Deleon Series

The Deleon series consists of deep, clayey soils on flood plains. The soils formed in alkaline, clayey alluvial sediment. Slope is 0 to 1 percent.

Typical pedon of Deleon silty clay, frequently flooded; from U.S. Highway 380 in Decatur, 8.5 miles south on Farm Road 51 and 100 feet west, on the flood plain of the West Fork of the Trinity River:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate very fine and fine subangular blocky structure; extremely hard, firm, sticky and plastic; common fine and medium roots; few fine pores; mildly alkaline; abrupt smooth boundary.

A1—6 to 30 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; extremely hard, firm, sticky and plastic; common fine roots; few fine pores; shiny faces on peds; common pressure faces; mildly alkaline; gradual boundary.

A2—30 to 48 inches; dark brown (10YR 4/3) silty clay, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky structure; extremely hard, firm, sticky and plastic; common fine roots and pores; few very fine black concretions; few very fine calcium carbonate concretions; common pressure faces; noncalcareous, moderately alkaline; gradual wavy boundary.

Ak—48 to 75 inches; dark brown (10YR 4/3) silty clay, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky structure; extremely hard, firm, sticky and plastic; few fine roots; common fine and medium pores; few black concretions; common fine concretions of calcium carbonate; few lenses of brown loamy material in lower part; calcareous, moderately alkaline; gradual smooth boundary.

Ab—75 to 80 inches; very dark grayish brown (10YR 3/2) silty clay loam, very dark brown (10YR 2/2) moist; moderate fine and medium subangular blocky structure; very hard, firm; few fine roots; common fine and medium pores; few lenses and streaks of brown loamy material; calcareous, moderately alkaline.

The solum is more than 60 inches thick. When the soil is dry, cracks 1/2 inch to 2 inches wide extend from the surface to a depth of 20 to 30 inches. The texture is silty clay, clay, or silty clay loam. Clay content in the 10- to 40-inch control section averages 35 to 55 percent.

The A horizon is dark grayish brown, very dark grayish brown, dark brown, or brown. Reaction is neutral to moderately alkaline, and in some pedons, the lower part of the horizon is calcareous.

Some pedons have a Bw horizon and a buried A horizon that are similar in color and texture to the A horizon. Films, threads, and concretions of calcium carbonate are common. Reaction is moderately alkaline, noncalcareous or calcareous.

The Deleon soils in Wise County are taxadjuncts to the Deleon series. They have montmorillonitic clay mineralogy. Interpretations are essentially the same as for those Deleon soils having mixed mineralogy.

Duffau Series

The Duffau series consists of deep, loamy and sandy soils on uplands. The soils formed in loamy sediment or weakly cemented sandstone. Slope ranges from 1 to 8 percent.

Typical pedon of Duffau very fine sandy loam, in an area of Weatherford-Duffau complex, 3 to 8 percent slopes; from U.S. Highway 81 in Decatur, 0.9 mile west on State Highway 380 and 100 feet south of the highway, in a pasture:

Ap—0 to 6 inches; yellowish brown (10YR 5/4) very fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky and weak fine granular structure; slightly hard, friable; common fine and medium roots; neutral; clear smooth boundary.

E—6 to 16 inches; light brown (7.5YR 6/4) very fine sandy loam, brown (7.5YR 5/4) moist; weak fine subangular blocky structure; slightly hard, friable; common fine and medium roots; neutral; clear smooth boundary.

Bt1—16 to 28 inches; yellowish red (5YR 4/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak fine and medium subangular blocky structure; hard, firm; common fine and medium roots; common distinct clay films 1 chroma less than soil matrix; few fine pores; neutral; gradual smooth boundary.

Bt2—28 to 54 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; weak fine and medium subangular blocky structure; hard, firm; common fine roots; common patchy clay films on faces of peds; few fine pores; neutral; gradual smooth boundary.

Bt3—54 to 66 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; common medium distinct strong brown (7.5YR 5/8) mottles; weak medium prismatic structure parting to weak fine and medium subangular blocky; hard, firm; few fine roots; few fine and medium pores; few thick reddish brown clay films on faces of prisms; few fine black spots; slightly acid; diffuse smooth boundary.

Bt4—66 to 80 inches; reddish yellow (5YR 6/6) sandy clay loam, yellowish red (5YR 5/6) moist; moderate medium prismatic structure parting to weak fine and medium subangular blocky; hard, firm; few fine roots; common fine and medium pores; common thick clay films on faces of prisms; few uncoated sand and silt grains on clay films; common fine black spots; slightly acid.

The solum ranges from 60 to more than 80 inches in thickness.

The A horizon is light yellowish brown, yellowish brown, pale brown, light brown, brown, or grayish brown. Texture is loamy fine sand, fine sandy loam, or very fine sandy loam. Reaction is slightly acid or neutral. Thickness ranges from 2 to 8 inches.

The E horizon is very pale brown, pale brown, brown, or light brown. Texture is loamy fine sand, fine sandy loam, or very fine sandy loam. Reaction is slightly acid or neutral. Thickness ranges from 4 to 12 inches.

The Bt horizon is reddish brown, yellowish red, reddish yellow, red, or strong brown. None to common reddish brown, yellowish red, or strong brown mottles are in the lower part of the Bt horizon. Texture is sandy clay loam, loam, or clay loam. Clay content of the upper 20 inches of the Bt horizon ranges from 20 to 30 percent. Reaction is medium acid to neutral.

Some pedons have a C horizon. Its color is shades of red, yellow, or white, and it is commonly stratified sandy clay loam, fine sandy loam, or weakly cemented sandstone. Reaction is slightly acid to mildly alkaline.

Exray Series

The Exray series consists of shallow, loamy and stony soils on uplands. The soils formed in strongly cemented sandstone. Slope ranges from 1 to 20 percent.

Typical pedon of Exray stony fine sandy loam, in an area of Bonti-Exray complex, stony, 1 to 8 percent slopes; from Texas Highway 101 in Bridgeport, 7.8 miles west on U.S. Highway 380 and 50 feet north of highway, near golf course:

A—0 to 4 inches; dark brown (10YR 4/3) stony fine sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky and weak fine granular structure; hard, very friable; many fine and medium roots; many fine pores; common scattered sandstone fragments as much as 6 inches across and few fragments as much as 18 inches across on surface and imbedded in horizon; neutral; clear smooth boundary.

E—4 to 6 inches; light yellowish brown (10YR 6/4) stony fine sandy loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky and weak fine granular structure; hard, friable; many fine and medium roots; many fine pores; common sandstone fragments as much as 6 inches across and few fragments as much as 18 inches across; neutral; abrupt smooth boundary.

Bt—6 to 16 inches; yellowish red (5YR 4/6) clay, dry and moist; moderate fine blocky structure; very hard, firm, sticky and plastic; common fine roots; many continuous clay films on faces of peds; few sandstone fragments as much as 6 inches across; medium acid; abrupt wavy boundary.

R—16 to 40 inches; pinkish white (7.5YR 8/2) strongly cemented fractured sandstone. Deep fractures filled with reddish clayey soil and with roots.

The solum ranges from 14 to 20 inches in thickness. Coarse fragments of gravel to stone size range from few to 15 percent of the volume of the surface layer.

The A horizon is dark grayish brown, brown, dark brown, or pale brown stony fine sandy loam or very stony fine sandy loam. Reaction is slightly acid or neutral.

The E horizon is brown, pale brown, light brown, or light yellowish brown stony fine sandy loam or very stony fine sandy loam. Reaction is slightly acid or neutral. Combined, the A and E horizons are 4 to 10 inches thick.

The Bt horizon is dark red, red, reddish brown, reddish yellow, or yellowish red clay loam, sandy clay, or clay. Clay content ranges from 35 to 50 percent. Reaction is medium acid or slightly acid.

The underlying sandstone is strongly cemented and fractured. Fractures are typically 6 to 20 inches apart.

The Exray soils in Wise County are taxadjuncts to the Exray series. The Bt horizon when moist has color value of more than 3, and most pedons have hue of 5YR. The differences, however, essentially do not affect the interpretations.

Frio Series

The Frio series consists of deep, loamy soils on flood plains. The soils formed in recent calcareous alluvium. Slope ranges from 0 to 2 percent.

Typical pedon of Frio silty clay loam, occasionally flooded; from U.S. Highway 380 in Decatur, 9.7 miles northeast on Farm Road 51, 0.1 mile north on Farm Road 1204, and 50 feet west, in a cultivated field on the flood plain of a small tributary of Denton Creek:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky and weak fine granular structure; hard, friable; common fine and medium roots; common wormcasts; calcareous, moderately alkaline; clear smooth boundary.

A1—10 to 28 inches; very dark grayish brown (10YR 3/2) silty clay, very dark brown (10YR 2/2) moist; moderate medium subangular blocky and moderate fine granular structure; hard, firm; common fine roots; few films and threads of calcium carbonate in lower part when dry; common wormcasts; calcareous, moderately alkaline; diffuse smooth boundary.

A2—28 to 40 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; very hard, firm; few fine roots; few films and threads of calcium carbonate; common wormcasts; calcareous, moderately alkaline; gradual wavy boundary.

Bk1—40 to 58 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; hard, firm; few fine roots; common films and threads and few very fine concretions of calcium carbonate; few wormcasts; calcareous, moderately alkaline; gradual smooth boundary.

Bk2—58 to 80 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, friable; few fine roots; common fine threads and seams and few very fine concretions and soft powdery masses of calcium carbonate; few shell fragments; few wormcasts; calcareous, moderately alkaline.

The solum ranges from 60 to more than 80 inches in thickness. Texture of the control section is silty clay loam, clay loam, or silty clay. The soil is calcareous and moderately alkaline throughout. Clay content in the control section ranges from 35 to 42 percent, and calcium carbonate equivalent ranges from 15 to 30 percent. The calcium carbonate equivalent increases below the control section. The COLE ranges from 0.04 to 0.09 in the upper 50 inches. Within the upper 50 inches, a layer 20 inches or more thick does not have COLE of 0.07 or more. Some soil layers have limestone, shell, or siliceous pebbles that make up less than 15 percent, by volume.

The A horizon is dark grayish brown, very dark grayish brown, very dark brown, or dark brown. It is 20 to 60 inches thick. The Bk horizon is brown, grayish brown, or light brownish gray. Some pedons have a buried A horizon below a depth of 40 inches.

Hassee Series

The Hassee series consists of deep, loamy soils on uplands. The soils formed in clayey, calcareous sediment. Slope ranges from 0 to 2 percent.

Typical pedon of Hassee fine sandy loam, 0 to 2 percent slopes; from Texas Highway 101 in Chico, 1.2 miles west on Farm Road 1810, 1.3 miles south on Farm Road 2952, 0.4 mile south on a county road, and 100 feet east, in a cultivated field:

Ap—0 to 9 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; very hard, friable; few fine roots; neutral; abrupt smooth boundary.

Eg—9 to 11 inches; light gray (10YR 7/1) fine sandy loam, light gray (10YR 6/1) moist; massive; very hard, friable; few fine roots; neutral; abrupt smooth boundary.

Btg1—11 to 26 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; few fine faint brownish mottles; strong medium blocky structure; extremely hard, very firm; few fine roots; continuous clay films on faces of peds; mildly alkaline; gradual wavy boundary.

Btg2—26 to 34 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; few fine faint brownish mottles; moderate medium blocky structure; very hard, very firm; continuous clay films on faces of peds; mildly alkaline; gradual smooth boundary.

Btk—34 to 48 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate fine blocky structure; very hard, very firm; few thin clay films on faces of peds; few concretions of calcium carbonate; moderately alkaline, calcareous; gradual smooth boundary.

BCk—48 to 68 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; few medium distinct light yellowish brown mottles, few streaks of light brownish gray (10YR 6/2) material; weak medium blocky structure; very hard, firm; common fine concretions of calcium carbonate; moderately alkaline, calcareous; gradual smooth boundary.

Ck—68 to 80 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; few fine distinct light yellowish brown (10YR 6/4) mottles, common streaks of darker material; massive; hard, friable; common films, threads, soft masses, and concretions of calcium carbonate; moderately alkaline, calcareous.

The solum ranges from 40 to 72 inches in thickness. The depth to concretions of calcium carbonate is 30 to 50 inches. Most pedons have a few siliceous or ironstone pebbles.

The A or Ap horizon is grayish brown, brown, dark grayish brown, or very dark grayish brown fine sandy loam. Reaction is slightly acid or neutral. The structure is massive and hard or very hard when dry. The A or Ap horizon is 3 to 12 inches thick.

The Eg horizon is light gray or very pale brown. It is 2 to 6 inches thick.

The Btg and Btk horizons are very dark grayish brown, very dark gray, dark grayish brown, gray, dark gray, or grayish brown. Clay content is 45 to 60 percent. Reaction is slightly acid to moderately alkaline. These horizons are calcareous in the lower part.

BCk and Ck horizons are grayish brown, light brownish gray, light gray, or very pale brown clay or clay loam that is moderately alkaline and calcareous. Clay content is 35 to 60 percent.

Heaton Series

The Heaton series consists of deep, sandy soils on uplands. The soils formed in thick beds of loamy sediment. Slope ranges from 3 to 8 percent.

Typical pedon of Heaton fine sand, in an area of Patilo-Heaton fine sands, 3 to 12 percent slopes; from U.S. Highway 380 in northeast Decatur, 1.7 miles northeast on Farm Road 51, 0.4 mile west on a county road, 1 mile northeast, 5 miles north to bridge crossing Black Creek, and 400 feet northwest of bridge:

A—0 to 10 inches; brown (10YR 5/3) fine sand, dark brown (10YR 4/3) moist; weak fine granular structure; loose, very friable; many fine and medium roots; slightly acid; clear smooth boundary.

E—10 to 24 inches; light yellowish brown (10YR 6/4) fine sand, yellowish brown (10YR 5/4) moist; weak fine granular structure; loose, very friable; common fine roots; neutral; clear wavy boundary.

Bt1—24 to 38 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, firm; few fine roots; common fine pores; common thin clay films on faces of peds; few fragments of sandstone; slightly acid; gradual wavy boundary.

Bt2—38 to 52 inches; reddish yellow (5YR 6/6) sandy clay loam, yellowish red (5YR 5/6) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, firm; few fine roots; common fine pores; common faint clay films on faces of peds; few fragments of weathered sandstone as much as 5 centimeters across long axis; slightly acid; gradual wavy boundary.

Bt3—52 to 77 inches; reddish yellow (7.5YR 6/6) sandy clay loam, strong brown (7.5YR 5/6) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, friable; few fine roots; common fine pores; common thin clay films on faces of peds; few black concretions; few fragments of weathered sandstone; neutral.

The solum is 60 to more than 80 inches thick. Some pedons have a few siliceous or ironstone pebbles. Average clay content in the control section is 20 to 30 percent.

The A horizon is brown, light yellowish brown, or very pale brown fine sand. Reaction is slightly acid or neutral.

The E horizon is light yellowish brown, very pale brown, or pink fine sand or loamy fine sand. Reaction is slightly acid or neutral. Combined, the A and E horizons are 20 to 40 inches thick.

The Bt horizon is yellowish red, red, reddish brown, or reddish yellow. Mottles in shades of yellow or brown range from none to common in the lower part of the Bt horizon. Texture is sandy clay loam; however, in some lower layers it includes fine sandy loam that has few to common streaks of uncoated sand. Reaction ranges from medium acid to neutral.

Hensley Series

The Hensley series consists of shallow, loamy and stony soils on uplands. The soils formed in fractured, very hard limestone. Slope ranges from 1 to 3 percent.

Typical pedon of Hensley very stony loam, 1 to 3 percent slopes; from Texas Highway 101 in Bridgeport, 9 miles west on U.S. Highway 380, 1.9 miles north on a county road, 0.4 mile west, 1.5 miles north on a county road to entrance to Boy Scout Ranch, 0.7 mile north on ranch road, and 50 feet west:

A—0 to 4 inches; dark brown (7.5YR 4/4) very stony loam, dark brown (7.5YR 3/2) moist; moderate fine subangular blocky and moderate fine granular structure; hard, friable; many fine and medium roots; limestone fragments 1 inch to 40 inches across on about 20 percent of surface and imbedded in horizon; neutral; clear smooth boundary.

Bt1—4 to 10 inches; red (2.5YR 4/6) clay loam, dark red (2.5YR 3/6) moist; moderate fine and medium blocky structure; very hard, friable; common fine and medium roots; many thick clay films, one chroma less than soil matrix, on faces of peds; neutral; gradual wavy boundary.

Bt2—10 to 18 inches; dark red (2.5YR 3/6) clay loam, dry and moist; moderate fine and medium blocky structure; very hard, firm, sticky and plastic; common fine and medium roots; many thick clay films, one chroma less than soil matrix, on faces of peds; neutral; abrupt smooth boundary.

R—18 to 22 inches; fractured indurated limestone with soil material and roots in fractures.

Thickness of the solum and depth to indurated limestone bedrock range from 10 to 20 inches. Limestone fragments cover 5 to 25 percent of the surface.

The A horizon is brown, dark brown, dark reddish brown, or reddish brown very stony loam. The content of limestone fragments ranges from 3 to 25 percent, by volume. Reaction ranges from slightly acid to mildly alkaline. The A horizon is 4 to 10 inches thick.

The Bt horizon is dark reddish brown, reddish brown, dark red, or red. Texture is clay loam or clay. Clay content is 35 to 55 percent. In some pedons, this horizon is as much as 15 percent limestone fragments. Reaction ranges from neutral to moderately alkaline.

The R layer is thick beds of hard, fractured limestone. The limestone weathers white or light gray and has fossils. It is typically calcareous.

Keeter Series

The Keeter series consists of deep, loamy soils on uplands. The soils formed in stratified packsand or sandstone that has loamy and shaly material (fig. 29). Slope ranges from 1 to 6 percent.

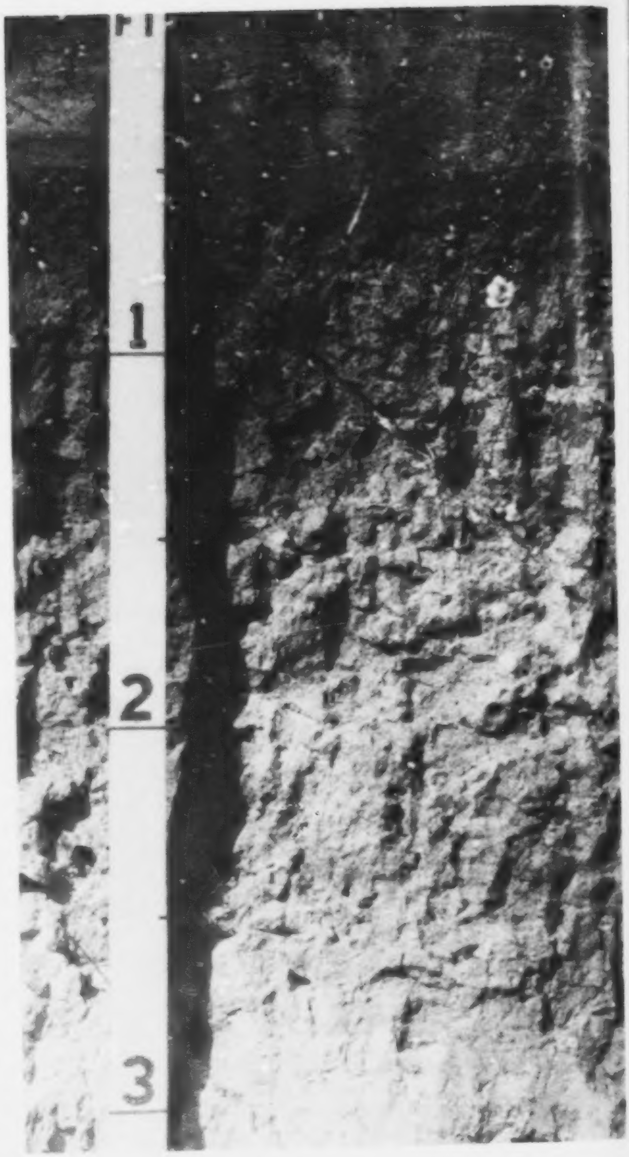

Figure 29.—In Keeter very fine sandy loam, the boundary is abrupt between the surface layer and the blocky clay loam subsoil. Weakly cemented packsand is at a depth of 34 inches.

Typical pedon of Keeter very fine sandy loam, 1 to 6 percent slopes; from Farm Road 1810 in Decatur, 3.15 miles north on U.S. Highway 81, 240 feet west on a county road, and 120 feet south, in a wooded area:

A—0 to 4 inches; brown (10YR 5/3) very fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; slightly hard, friable; common fine roots and few medium roots; few fine pores; slightly acid; clear wavy boundary.

E—4 to 7 inches; light brown (7.5YR 6/4) very fine sandy loam, brown (7.5YR 5/4) moist; weak fine granular structure; slightly hard, friable; common fine roots and few medium roots; few fine pores; slightly acid; abrupt smooth boundary.

Bt1—7 to 15 inches; red (2.5YR 5/6) clay loam, red (2.5YR 4/6) moist; moderate medium blocky structure; very hard, firm; common fine and few medium roots; continuous thick dark red clay films on vertical and horizontal ped surfaces; few sand and silt grains on vertical ped surfaces in upper part; strongly acid; gradual smooth boundary.

Bt2—15 to 23 inches; red (2.5YR 5/6) clay loam, red (2.5YR 4/6) moist; common fine and medium reddish yellow (7.5YR 7/6) mottles; moderate medium prismatic structure parting to moderate fine and medium blocky; very hard, firm; few fine and medium roots; few fine pores in ped interiors; nearly continuous dark red clay films on vertical and horizontal ped surfaces; strongly acid; gradual smooth boundary.

Bt3—23 to 28 inches; reddish yellow (5YR 6/6) clay loam, yellowish red (5YR 5/6) moist; common medium distinct red (2.5YR 5/6), pale brown (10YR 6/3), and light yellowish brown (10YR 6/4) mottles; moderate medium prismatic structure parting to moderate fine and medium blocky; hard, friable; few fine and medium roots; common fine pores in ped interiors; common thick reddish brown clay films on vertical and horizontal ped surfaces; medium acid; clear wavy boundary.

BC—28 to 33 inches; variegated color pattern, predominantly reddish yellow (7.5YR 6/6 and 6/8) and very pale brown (10YR 8/3) loam, strong brown (7.5YR 5/6, 5/8) and very pale brown (10YR 7/3) moist; moderate medium prismatic structure parting to weak fine subangular blocky; hard, friable; few fine and medium roots; few fine pores; about 12 percent weakly cemented sandstone fragments less than 1 inch to 3 inches across; common reddish brown and yellowish red clay films incase sandstone fragments and most peds; medium acid; clear smooth boundary.

C1—33 to 41 inches; stratified very pale brown (10YR 8/3) and white (10YR 8/2) packsand, very pale brown (10YR 7/3) and light gray (10YR 7/2) moist; common medium distinct pink (7.5YR 7/4) mottles; cemented, friable; brownish clay films in few fractures; few fine and medium roots; slightly acid; clear smooth boundary.

C2—41 to 72 inches; very pale brown (10YR 8/3) packsand, very pale brown (10YR 7/3) moist; stratified with thin layers of light gray sandstone; weakly cemented, friable; few fine roots; few fine calcium carbonate concretions in gray layers; mildly alkaline.

The solum is 20 to 40 inches thick. The depth to packsand or sandstone commonly is the same. The clay content in the control section ranges from 25 to 35 percent. Siliceous or ironstone pebbles range from 0 to 5 percent. Base saturation ranges from 75 to 100 percent in some parts of the argillic horizon.

The A or Ap horizon is brown, light brown, dark grayish brown, grayish brown, light brownish gray, or pale brown. It is 3 to 6 inches thick. The E horizon is brown, pale brown, light brown, or light yellowish brown. It is at least 5 inches thick. The reaction of the A and E horizons is slightly acid or neutral. The texture is very fine sandy loam. Some pedons do not have an E horizon.

The Bt1 horizon is red, reddish brown, reddish yellow, light reddish brown, or yellowish red. Texture is clay loam, sandy clay loam, or sandy clay. Reaction ranges from strongly acid to slightly acid.

The Bt2 horizon is red, light red, light reddish brown, reddish yellow, reddish brown, yellowish red, or strong brown. Some pedons have few to common mottles in shades of red, yellow, or brown. Texture is clay loam, sandy clay loam, or very fine sandy loam. Reaction ranges from strongly acid to slightly acid.

The Bt3 and BC horizons are reddish yellow, yellowish red, yellow, strong brown, brownish yellow, yellowish brown, or dark yellowish brown. Some pedons are mottled or have a variegated color pattern. Mottles are in shades of red, yellow, or brown. Texture is very fine sandy loam, loam, sandy clay loam, or clay loam. Some pedons have a few fine calcium carbonate concretions. Thin discontinuous strata or fragments less than 3 inches across range from few to common in most BC horizons. Reaction ranges from medium acid to neutral.

The C horizon is stratified packsand or sandstone in shades of brown, gray, or white. Mottles in shades of pink, yellow, or brown range from none to common. Some pedons have thin strata of grayish and brownish loamy or shaly material. Texture of the matrix ranges from loamy fine sand to very fine sandy loam. This material is hard to weakly cemented when dry and friable to slightly brittle when moist. In exposed roadcuts, it is weakly to strongly cemented. Some pedons have a few calcium carbonate concretions, and in some pedons, the matrix is weakly calcareous in spots. Reaction is slightly acid to moderately alkaline.

Lindy Series

The Lindy series consists of moderately deep, loamy soils on uplands. The soils formed over thick beds of indurated limestone. Slope ranges from 1 to 3 percent.

Typical pedon of Lindy loam, 1 to 3 percent slopes; from Texas Highway 101 in Bridgeport, 5.6 miles southwest on U.S. Highway 380, 0.2 mile south on a private road, and 50 feet east, in a pasture:

Ap—0 to 6 inches; reddish brown (5YR 5/3) loam, dark reddish brown (5YR 3/4) moist; weak medium subangular blocky and weak medium granular structure, thin platy in surface inch; very hard, friable; many fine roots; neutral; abrupt smooth boundary.

Bt1—6 to 16 inches; reddish brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) moist; moderate medium blocky structure; very hard, firm; patchy clay films on faces of peds; fine roots and fine pores; neutral; clear wavy boundary.

Bt2—16 to 24 inches; reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) moist; strong fine blocky structure; many acute and obtuse angles; extremely hard, very firm; continuous clay films on faces of peds; common fine roots mainly between peds; few fine pores; neutral; abrupt wavy boundary.

R—24 to 40 inches; hard crystaline limestone fragments in the upper 6 inches; pendants of precipitated calcium carbonate on lower side of limestone fragments; reddish brown clay and roots in the interstices; massive limestone below.

Thickness of the solum and depth to limestone bedrock range from 20 to 40 inches. The contact is abrupt to limestone bedrock or grades into fractured and bedded limestone that has soil in the interstices.

The A or Ap horizon is reddish brown or brown loam. It is slightly acid or neutral. The horizon is 4 to 9 inches thick.

The Bt horizon is reddish brown, yellowish red, dark reddish brown, or brown. It is clay loam or clay. The clay content is 35 to 45 percent. Reaction is neutral or mildly alkaline.

May Series

The May series consists of deep, loamy soils on uplands. The soils formed in loamy, calcareous, alluvial sediment. Slope ranges from 0 to 2 percent.

Typical pedon of May fine sandy loam, 0 to 2 percent slopes; from U.S. Highway 380 in Decatur, 3.4 miles north on Farm Road 730, 0.9 mile west on a county road, 4.9 miles north, 0.7 mile east, 1.46 miles north on a Forest Service road, and 1,225 feet east of road:

A1—0 to 6 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky and weak fine granular structure; slightly hard, friable; many fine and medium roots; slightly acid; clear smooth boundary.

A2—6 to 14 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak very fine subangular blocky and weak very fine granular structure; slightly hard, friable; many fine and medium roots; slightly acid; clear smooth boundary.

Bt1—14 to 30 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; hard, slightly firm; few fine roots; common fine pores; thin discontinuous clay films on faces of peds; neutral; clear smooth boundary.

Bt2—30 to 42 inches; brown (7.5YR 5/2) clay loam, dark brown (7.5YR 4/2) moist; common medium distinct yellowish red (5YR 5/6) mottles; moderate fine and medium blocky structure; very hard, firm; few fine roots; few fine pores; common clay films on faces of peds; neutral; gradual wavy boundary.

Bk—42 to 64 inches; yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; common medium distinct strong brown (7.5YR 5/6) and common medium faint pale brown (10YR 6/3) mottles; moderate fine and medium subangular blocky structure; hard, friable; few fine roots; common fine and medium pores; common threads and concretions of calcium carbonate; calcareous, moderately alkaline.

The solum is 40 to 70 inches thick. Depth to films, threads, and soft masses of calcium carbonate ranges from 36 to 60 inches.

The A horizon is brown, grayish brown, dark grayish brown, dark yellowish brown, or yellowish brown fine sandy loam. Organic matter is less than 1 percent. Reaction is slightly acid to mildly alkaline. The horizon is 8 to 20 inches thick.

The Bt horizon is brown, dark grayish brown, yellowis brown, or light yellowish brown. Some pedons have mottles in shades of red or yellow in the lower part of this horizon. Texture is sandy clay loam or clay loam. Clay content ranges from 20 to 35 percent. Reaction is neutral or mildly alkaline.

The Bk horizon is in shades of brown. Some pedons have mottles in shades of yellow or brown. The texture is sandy clay loam, loam, or fine sandy loam. Reaction moderately alkaline and calcareous.

Medlin Series

The Medlin series consists of deep, clayey and ston cyclic soils on uplands. The soils formed in marly, shal and clayey alkaline marine sediment. Slope ranges fro 5 to 15 percent.

Typical pedon of Medlin stony clay, in an area of Medlin-Sanger stony clays, 5 to 15 percent slopes; fro Farm Road 51 in east Decatur, 9.8 miles east on U.S. Highway 380, 1.35 miles north on a county road to Allison Community, 2 miles northeast to county road intersection, and 0.75 mile east, in rangeland:

A1—0 to 7 inches; dark grayish brown (10YR 4/2) stony clay; very dark grayish brown (10YR 3/2) moist; moderate fine and very fine blocky structure; very hard, very firm, very sticky and plastic; many fine and medium roots; common fine pores; common wormcasts and channels; common angular weathered limestone fragments less than 3 inches across imbedded and on the surface; limestone fragments 3 to 36 inches across and 1 to 6 inches thick about 2 to 4 percent of the surface; calcareous, moderately alkaline; clear wavy boundary.

A2—7 to 13 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; common medium distinct light olive brown (2.5Y 5/4) mottles; common vertical dark streaks; moderate fine and very fine blocky structure; extremely hard, very firm, very sticky and plastic; common fine and medium roots; common fine pores; few wormcasts and channels; few fine concretions of calcium carbonate; common weathered limestone fragments as much as 1 inch across; calcareous, moderately alkaline; gradual wavy boundary.

Bw—13 to 29 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; common medium faint light olive brown (2.5Y 5/6) mottles; few dark streaks; moderate coarse angular blocky structure parting to fine blocky; extremely hard, very firm, very sticky and plastic; few fine and medium roots; few fine pores; common coarse intersecting slickensides; shiny surfaces on peds; few fine concretions and soft masses of calcium carbonate; few weathered limestone fragments as much as 1 inch across; calcareous, moderately alkaline; gradual wavy boundary.

Bk—29 to 44 inches; light yellowish brown (2.5Y 6/4) clay, light olive brown (2.5Y 5/4) moist; many medium faint light olive brown (2.5Y 5/6) mottles; common dark streaks; moderate coarse angular blocky structure parting to fine blocky; extremely hard, very firm, very sticky and plastic; few fine roots; many coarse intersecting slickensides; few fine black concretions; common fine and medium concretions of calcium carbonate; few angular limestone fragments as much as 2 inches across; calcareous, moderately alkaline; gradual wavy boundary.

C—44 to 60 inches; stratified and bedded light olive brown (2.5Y 5/4), brownish yellow (10YR 6/6), and light olive gray (5Y 6/2) shaly clay, olive brown (2.5Y 4/4), yellowish brown (10YR 5/6), and olive gray (5Y 5/2) moist; massive; extremely hard, very firm, very sticky and plastic; few fine roots penetrate fractures in upper part; common masses of calcium carbonate in upper part; calcareous, moderately alkaline.

The solum ranges from 40 to more than 60 inches in thickness. Gilgai microrelief of microridges 4 to 8 inches higher than microvalleys is in undisturbed areas of Medlin soils. Cycles of ridges and valleys are repeated each 6 to 23 feet perpendicular to the slope. When the soil is dry, cracks 1 to 2 inches wide extend to a depth of 20 inches or more. The clay content ranges from 40 to 60 percent throughout. Limestone fragments up to 36 inches across cover 2 to 4 percent of the soil surface.

The A horizon is dark grayish brown, grayish brown, brown, or light olive brown stony clay. When moist and color value is less than 3.5, the horizon is less than 12 inches thick.

The Bw and Bk horizons are grayish brown, brown, light brownish gray, pale brown, light yellowish brown, light olive brown, or olive. Most pedons have few to common mottles in shades of gray, brown, or yellow. The calcium carbonate equivalent in the lower part of these horizons ranges from 30 to 45 percent.

The C horizon is stratified and mottled light olive brown, brownish yellow, light olive gray, light yellowish brown, grayish brown, yellowish brown, olive yellow, or olive. It is shaly clay, marly clay, or silty clay.

Mingo Series

The Mingo series consists of moderately deep, loamy soils on uplands. The soils formed in interbedded limestone and marl. Slope ranges from 1 to 3 percent.

Typical pedon of Mingo silty clay loam, 1 to 3 percent slopes; from Farm Road 730 in Decatur, 1.1 miles southeast on U.S. Highway 81, 0.5 mile north on Loop 357, and 1,100 feet east, in cropland:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate very fine and fine subangular blocky structure; very hard, firm, sticky and plastic; many fine and medium roots; neutral; clear smooth boundary.

Bt1—7 to 22 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate fine and medium blocky structure; very hard, very firm, very sticky and plastic; common fine and medium roots; common distinct clay films on faces of peds; few fine black concretions; few limestone fragments less than 1 inch across; common pressure faces; mildly alkaline; gradual smooth boundary.

Bt2—22 to 33 inches; dark brown (10YR 4/3) silty clay, dark brown (10YR 3/3) moist; moderate fine and medium blocky structure; extremely hard, very firm, very sticky and plastic; few fine roots; common distinct clay films on faces of peds; few fine black concretions; few concretions of calcium carbonate; few limestone fragments less than 1 inch across;

many large pressure faces; mildly alkaline; abrupt smooth boundary.

R—33 to 44 inches; coarsely fractured limestone; soil material and few roots in fractures; fractures decrease with depth.

Thickness of the solum and depth to limestone bedrock range from 22 to 34 inches. The upper part of the solum has mollic colors to a depth of 20 inches or more.

The A or Ap horizon is brown, dark brown, or dark grayish brown silty clay loam. Reaction is neutral or mildly alkaline. The horizon is 5 to 16 inches thick.

The Bt horizon is brown, dark brown, dark reddish gray, dark reddish brown, or dark grayish brown silty clay, clay, or silty clay loam. The COLE of the Bt horizon ranges from 0.07 to 0.09, but the potential linear extensibility is less than 6 cm. Clay content ranges from 35 to 55 percent. Reaction is neutral to moderately alkaline. The lower part of the Bt horizon is calcareous in some pedons.

The underlying limestone is coarsely fractured and is interbedded with calcareous, clayey marl.

Nimrod Series

The Nimrod series consists of deep, sandy soils on uplands. The soils formed in sandy and loamy sediment. Slope ranges from 1 to 4 percent.

Typical pedon of Nimrod fine sand, 1 to 4 percent slopes; from U.S. Highway 81 in Decatur, 2.2 miles south on Farm Road 730 and 1,100 feet east:

Ap—0 to 8 inches; pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; weak medium granular structure; loose, very friable; many fine and medium roots; slightly acid; abrupt smooth boundary.

E—8 to 24 inches; very pale brown (10YR 8/3) fine sand, very pale brown (10YR 7/4) moist; common medium faint light yellowish brown (10YR 6/4) mottles in lower part; single grained; loose, very friable; many fine and medium roots; neutral; abrupt smooth boundary.

Bt1—24 to 32 inches; brownish yellow (10YR 6/6) sandy clay loam, yellowish brown (10YR 5/6) moist; many medium distinct light brownish gray (10YR 6/2), many medium faint reddish yellow (7.5YR 6/6), and few medium prominent red (2.5YR 4/6) mottles; weak medium subangular blocky structure; hard, friable; common fine and medium roots; many fine and medium pores; few wormcasts; common clay films on faces of peds; medium acid; clear smooth boundary.

Bt2—32 to 42 inches; coarsely and prominently mottled light brownish gray (2.5Y 6/2) and red (2.5YR 4/8) sandy clay loam, grayish brown (2.5Y 5/2) and red (2.5YR 4/8) moist; common medium distinct brownish yellow (10YR 6/6) mottles surround red mottles; moderate coarse prismatic structure parting to weak medium subangular blocky; hard, firm; few fine roots; many fine and medium pores; few wormcasts; many thick clay films on faces of peds; uncoated sand on faces of some prisms; strongly acid; gradual smooth boundary.

Bt3—42 to 62 inches; light gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist; many coarse prominent red (2.5YR 5/8) and common medium distinct brownish yellow (10YR 6/6) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable; few fine and medium pores in light gray matrix; thick light brownish gray (10YR 6/2) clay flows; few pockets of uncoated sand; strongly acid; gradual smooth boundary.

C—62 to 80 inches; reddish yellow (5YR 6/6) sandy loam, yellowish red (5YR 5/8) moist; few coarse prominent light gray (10YR 7/2) and common medium distinct pink (7.5YR 7/4) mottles; massive; brittle; common streaks of uncoated sand penetrate upper few inches; strongly acid.

The solum ranges from 60 to 80 inches or more in thickness. Clay content within the control section ranges from 20 to 35 percent.

The A or Ap horizon is brown, pale brown, yellowish brown, or light yellowish brown fine sand. The E horizon is very pale brown, white, or light yellowish brown fine sand. Reaction of the A and E horizons is slightly acid or neutral. Combined thickness of the A and E horizons is 20 to 40 inches.

The Bt horizon is light gray, light brownish gray, reddish yellow, brownish yellow, or yellowish brown. It is mottled in shades of brown, yellow, red, or gray. Texture is sandy clay loam or clay loam. Reaction is strongly acid or medium acid.

The C horizon is in shades of yellow or brown and is mottled in shades of red, gray, yellow, or brown. Texture is sandy clay loam, sandy loam, or weakly cemented sandstone. Reaction is strongly acid to slightly acid.

Owens Series

The Owens series consists of deep, clayey and stony soils on uplands. The soils formed in beds of shale and clay. Slope ranges from 8 to 30 percent.

Typical pedon of Owens very stony clay, 8 to 30 percent slopes; from Texas Highway 101 in Bridgeport, 6.9 miles west on U.S. Highway 380, 0.4 mile south and southwest on Port-O-Call Drive in Runaway Bay, and 200 feet south, on side of hill:

A—0 to 7 inches; grayish brown (2.5Y 5/2) very stony clay, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky and granular structure; very hard, very firm, very sticky and plastic; many fine and medium roots; common fine pores; thin granular crust on surface after drying; few fine concretions of calcium carbonate; limestone fragments and stones mainly less than 12 inches across but few as much as 30 inches across on about 8 percent of surface; common limestone fragments less than 3 inches across in surface layer; calcareous, moderately alkaline; gradual smooth boundary.

Bk—7 to 18 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; moderate fine and medium blocky structure; extremely hard, very firm, very sticky and plastic; common fine and medium roots; few fine pores; common fine concretions of calcium carbonate; few limestone fragments as much as 3 inches across; calcareous, moderately alkaline; gradual smooth boundary.

C—18 to 40 inches; mottled light olive brown (2.5Y 5/4) and grayish brown (2.5Y 5/2) shaly clay; common medium distinct light olive gray (5Y 6/2) and brownish yellow (10YR 6/8) mottles; massive; extremely hard, very firm, very sticky and plastic; few fine roots; few fine and medium concretions of calcium carbonate; calcareous, moderately alkaline.

The solum ranges from 14 to 30 inches in thickness. The soil is moderately alkaline throughout, but some pedons are noncalcareous in the upper part. Fragments of limestone, sandstone, and ironstone ranging from 3 to 48 inches across cover 5 to 15 percent of the surface.

The A horizon is olive, pale olive, olive brown, light olive brown, brown, grayish brown, or light brownish gray very stony clay. It is 3 to 10 inches thick.

The Bk horizon is olive, pale olive, olive brown, light olive brown, grayish brown, light brownish gray, pale brown, brown, yellowish brown, or light yellowish brown. Texture is clay or silty clay. Clay content ranges from 35 to 60 percent.

The C horizon is olive, grayish brown, light olive brown, light yellowish brown, or light olive gray. Texture is shaly clay, very shaly clay, or stratified loamy, clayey, and shaly material.

Palopinto Series

The Palopinto series consists of very shallow and shallow, loamy and stony soils on uplands. The soils formed in limestone. Slope ranges from 1 to 8 percent.

Typical pedon of Palopinto extremely stony silty clay loam, 1 to 8 percent slopes; from Texas Highway 101 in Bridgeport, 9 miles west on U.S. Highway 380, 1.9 miles north on a county road, 0.4 mile west, 1.5 miles north to entrance to Boy Scout Ranch, 0.45 mile north on ranch road, 0.3 mile east, 150 feet south of road, and 30 feet west of small drainageway:

A1—0 to 4 inches; dark brown (7.5YR 4/2) extremely stony silty clay loam, dark brown (7.5YR 3/2) moist; moderate fine subangular blocky structure; hard, friable; many roots; common fine and very fine pores; few wormcasts and channels; about 30 percent, by volume, limestone fragments from 6 to 48 inches across, about 5 percent limestone fragments less than 3 inches across; mildly alkaline; clear smooth boundary.

A2—4 to 15 inches; reddish brown (5YR 4/3) extremely stony silty clay loam, dark reddish brown (5YR 3/3) moist; weak fine subangular blocky and moderate fine granular structure; hard, friable; common roots; few fine and very fine pores; few wormcasts and channels; about 75 percent, by volume, limestone fragments from 10 to 30 inches across, few fragments less than 10 inches across; mildly alkaline; abrupt wavy boundary.

R—15 to 20 inches; coarsely fractured limestone; roots and soil in fractures.

The solum ranges from 6 to 20 inches to indurated limestone. It has 35 to 85 percent coarse fragments of limestone, of which 25 to 60 percent is in the A1 horizon and from 50 to 90 percent is in the A2 horizon. Fragments are flat and mainly less than 10 inches thick. They range from 0.5 inch to 48 inches across, but are dominantly 6 to 36 inches. Reaction is mildly alkaline or moderately alkaline, and some pedons are calcareous.

The A horizon is dark grayish brown, very dark grayish brown, reddish brown, dark brown, brown, or reddish brown extremely stony silty clay loam.

Patilo Series

The Patilo series consists of deep, sandy soils on uplands. The soils formed in thick, sandy and loamy sediment. Slope ranges from 3 to 12 percent.

Typical pedon of Patilo fine sand, in an area of Patilo-Heaton fine sands, 3 to 12 percent slopes; from U.S. Highway 380 in northeast Decatur, 1.7 miles northeast on Farm Road 51, 0.4 mile west on a county road, 1 mile northeast, 5 miles north to bridge crossing Black Creek, and 750 feet northwest, in a pasture:

A—0 to 10 inches; brown (10YR 5/3) fine sand, dark brown (10YR 4/3) moist; weak fine granular structure; loose, very friable; many krotovinas filled with lighter colored fine sand; many fine roots; neutral; clear smooth boundary.

E—10 to 43 inches; very pale brown (10YR 7/3) fine sand, brown (10YR 5/3) moist; single grained; loose; common fine roots; slightly acid; gradual wavy boundary.

Bt1—43 to 50 inches; light gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist; common medium distinct brownish yellow (10YR 6/6) and yellowish brown (10YR 5/6) mottles; weak subangular blocky structure; very hard, firm; few fine roots; common distinct clay films on faces of peds; slightly acid; gradual wavy boundary.

Bt2—50 to 58 inches; light gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist; common medium prominent dark red (2.5YR 3/6) and common medium distinct reddish yellow (7.5YR 6/6) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; very hard, firm; few fine roots; common distinct clay films on faces of peds; slightly acid; diffuse wavy boundary.

Bt3—58 to 80 inches; coarsely and prominently mottled yellowish red (5YR 5/8), light gray (10YR 7/2), and yellow (10YR 7/6) sandy clay loam, mottled yellowish red (5YR 4/8), light brownish gray (10YR 6/2), and brownish yellow (10YR 6/6) moist; moderate coarse prismatic structure parting to weak medium subangular blocky; hard, firm; few fine roots; many thick clay films on faces of prisms; uncoated sand grains on faces of some prisms; slightly acid.

The solum is more than 80 inches thick.

The A horizon is dark brown, grayish brown, brown, light brownish gray, pale brown, or very pale brown fine sand. Reaction is slightly acid or neutral.

The E horizon is pale brown, very pale brown, or light gray fine sand or loamy fine sand. Reaction is slightly acid or neutral. Combined thickness of the A and E horizons ranges from 40 to 72 inches.

The Bt horizon is light gray, light brownish gray, strong brown, very pale brown, brownish yellow, reddish yellow, or yellowish red and has few to common reddish, yellowish, and grayish mottles, or the matrix is mottled in these colors. Texture is dominantly sandy clay loam. Clay content ranges from 20 to 35 percent. Reaction ranges from strongly acid to slightly acid.

Ponder Series

The Ponder series consists of deep, loamy soils on uplands. The soils formed in calcareous, loamy marine sediment. Slope ranges from 1 to 3 percent.

Typical pedon of Ponder clay loam, 1 to 3 percent slopes; from Farm Road 51 in northeast Decatur, 11.1 miles east on U.S. Highway 380 to a county road separating Wise and Denton counties, 0.54 mile north on the county road, and 300 feet west, in rangeland:

A—0 to 7 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; many fine and medium roots; few wormcasts and channels; few fine black and brown concretions; neutral; clear wavy boundary.

Bt1—7 to 17 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; moderate medium blocky structure; extremely hard, very firm, very sticky and plastic; common fine and medium roots; few wormcasts and channels; few thin patchy clay films on faces of peds; few fine black concretions; neutral; gradual wavy boundary.

Bt2—17 to 28 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; few fine faint yellowish brown mottles; weak coarse blocky structure parting to moderate medium blocky; extremely hard, very firm, very sticky and plastic; few fine roots; common pressure faces; few thin clay films on faces of peds; few fine black concretions; common fine and medium hard pitted concretions of calcium carbonate; moderately alkaline; gradual wavy boundary.

Bt3—28 to 54 inches; yellowish brown (10YR 5/4) clay, dark yellowish brown (10YR 4/4) moist; moderate coarse blocky structure; extremely hard, very firm, very sticky and plastic; few fine roots; common pressure faces and small slickensides; common clay films on faces of peds; few fine and medium black concretions; common fine and medium hard pitted concretions of calcium carbonate and few soft masses in lower part; calcareous, moderately alkaline; gradual wavy boundary.

BCk—54 to 80 inches; reddish yellow (7.5YR 6/6) silty clay loam, strong brown (7.5YR 5/6) moist; few fine distinct yellowish red and brown mottles; moderate fine and medium subangular blocky structure; extremely hard, very firm, sticky and plastic; few fine roots; common clay films on faces of peds; common black concretions; common concretions and soft masses of calcium carbonate; few pebbles of limestone; calcareous, moderately alkaline.

The solum ranges from 60 to more than 80 inches in thickness. The depth to secondary carbonates ranges from 30 to 50 inches. Undisturbed areas have weakly expressed gilgai microrelief. The COLE ranges from 0.07 to 0.11 in the upper 20 inches of the control section, and the PLE exceeds 2.5 inches in the upper 50 inches of the pedon.

The A horizon is very dark grayish brown, dark grayish brown, dark brown, or brown clay loam. Reaction is slightly acid or neutral. The A horizon is 4 to 10 inches thick.

The Bt1 horizon is mainly yellowish brown, brown, grayish brown, or dark grayish brown. In places, however, the crest of the subsoil wave is reddish brown, and the center of troughs is dark gray. Texture is clay or clay loam. Clay content ranges from 35 to 50 percent. Reaction is slightly acid or neutral.

The Bt2 and Bt3 horizons are brown, strong brown, dark grayish brown, grayish brown, yellowish brown, or light olive brown clay. Mottles in shades of red and brown range from none to common. Reaction is mildly alkaline or moderately alkaline.

The BCk horizon is reddish yellow, light brown, light yellowish brown, yellowish brown, or yellow. Texture is silty clay loam, silt loam, or clay loam. The calcium carbonate equivalent is 20 to more than 60 percent. Concretions and soft masses of calcium carbonate range from common to many.

Some pedons have a C horizon. It is calcareous, loamy material in shades of brown, white, or gray. Thin strata of weakly cemented chalk and a few limestone fragments are in some pedons.

Pulexas Series

The Pulexas series consists of deep, loamy soils on flood plains. The soils formed in stratified loamy alluvium (fig. 30). Slope ranges from 0 to 2 percent.

Typical pedon of Pulexas very fine sandy loam, occasionally flooded; from Farm Road 1810 in Decatur, 6.6 miles northwest on U.S. Highway 81 and 2,600 feet west, on flood plain of Briar Branch:

Ap—0 to 7 inches; light yellowish brown (10YR 6/4) very fine sandy loam, dark brown (10YR 4/3) moist; weak fine granular and subangular blocky structure; slightly hard, very friable; common fine and medium roots; few fine pores; few wormcasts; neutral; abrupt smooth boundary.

C1—7 to 40 inches; light yellowish brown (10YR 6/4) very fine sandy loam, brown (10YR 5/3) moist; massive; few thin strata of dark brown (10YR 4/3) loam, thinly to coarsely stratified with many bedding planes; slightly hard, very friable; common fine roots; common fine and medium pores; common wormcasts; neutral; gradual smooth boundary.

C2—40 to 61 inches; brown (10YR 5/3) very fine sandy loam, dark brown (10YR 4/3) moist; massive; common thin strata of dark brown (10YR 4/3) loam; common bedding planes; hard, friable; few fine roots; common fine and medium pores; few wormcasts and channels; neutral; clear smooth boundary.

Ab—61 to 72 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak fine blocky structure; hard, friable; few fine roots; common fine pores; few wormcasts and channels; neutral.

The 10- to 40-inch control section is very fine sandy loam, fine sandy loam, or loam that is stratified with thin lenses of loamy fine sand, sandy clay loam, or other listed textures. The clay content averages 8 to 18 percent. Reaction ranges from slightly acid to mildly alkaline.

The A horizon is grayish brown, brown, pale brown, yellowish brown, or light yellowish brown. It is 3 to 15 inches thick.

The C horizon is light brownish gray, brown, yellowish brown, or light yellowish brown. Some pedons have a dark-colored buried horizon below a depth of 30 inches.

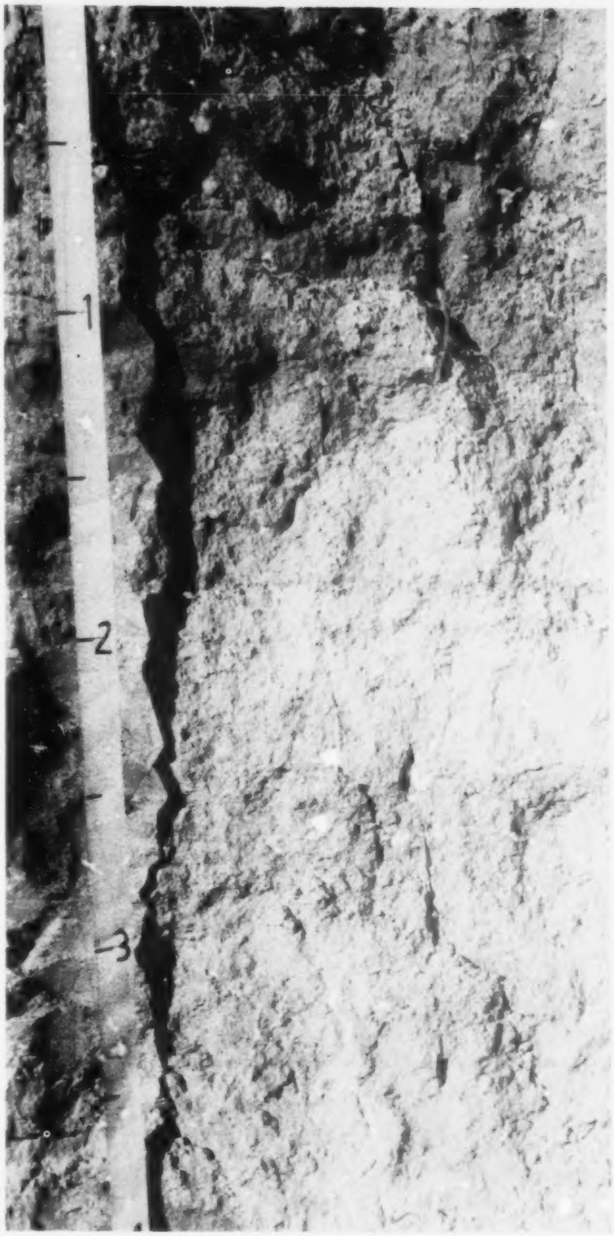

Figure 30.—Stratification in Pulexas soils, frequently flooded, is faint to distinct. Scale is in feet.

Purves Series

The Purves series consists of shallow and very shallow, clayey soils on uplands. The soils formed in weathered, interbedded limestone and clayey material. Slope ranges from 1 to 3 percent.

Typical pedon of Purves clay, 1 to 3 percent slopes; from U.S. Highway 380 in northeast Decatur, 12.4 miles northeast on Farm Road 51, 2.6 miles north on Farm Road 455, 360 feet east on a county road, and 100 feet north, in rangeland:

A1—0 to 4 inches; very dark gray (10YR 3/1) clay, very dark gray (10YR 3/1) moist; moderate very fine and fine subangular blocky structure; very hard, firm; many fine and medium roots; common wormcasts; common fine and medium pores; few fine fragments of limestone; calcareous, moderately alkaline; gradual smooth boundary.

A2—4 to 12 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate very fine and fine subangular blocky structure; very hard, firm; many fine and medium roots; common fine and medium pores; common wormcasts; few to common concretions of calcium carbonate up to 5 millimeters in diameter; few fine fragments of limestone; few very fine black concretions; calcareous, moderately alkaline; clear smooth boundary.

A3—12 to 15 inches; very dark grayish brown (10YR 3/2) very gravelly clay, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure; very hard, firm; common fine roots; common wormcasts; about 40 percent, by volume, limestone fragments up to 6 inches across; calcium carbonate coatings up to 6 millimeters thick on fragments; common very fine concretions of calcium carbonate; few very fine black concretions; few fine siliceous pebbles; calcareous, moderately alkaline; abrupt smooth boundary.

R—15 to 20 inches; fractured indurated limestone; soil and roots penetrate fractures.

The solum ranges from 8 to 20 inches in thickness. Clay content ranges from 35 to 55 percent. Reaction is calcareous and moderately alkaline throughout. Limestone fragments range from 5 to 35 percent, by volume, in the A horizon.

The A horizon is very dark gray, dark gray, very dark grayish brown, dark grayish brown, grayish brown, or brown. The A1 and A2 horizons are clay, silty clay loam, or silty clay, and the A3 horizon is gravelly clay, very gravelly clay, or gravelly clay loam.

The R layer is fractured limestone interbedded with marly and clayey material. Soil and roots are in the fractures.

The Purves soils in Wise County are taxadjuncts to the Purves series. The R layer is fractured and interbedded with weakly cemented limestone or clayey layers. It can be ripped and excavated with conventional digging equipment. The management of these soils is the same as for other soils in the Purves series.

Sanger Series

The Sanger series consists of deep, clayey, cyclic soils on uplands. The soils formed in alkaline clayey marine sediment. Slope ranges from 1 to 12 percent.

Typical pedon of Sanger clay, 3 to 5 percent slopes; from Texas Highway 114 on southeast side of Rhome, 2.8 miles south on U.S. Highway 81, 1.3 miles west on a county road to metal gate and pipe line crossing, and 225 feet south, in rangeland:

A1—0 to 10 inches; very dark grayish brown (10YR 3/2) clay, very dark brown (10YR 2/2) moist; moderate very fine granular and moderate medium subangular blocky structure; extremely hard, very firm, very sticky and plastic; many fine and medium roots; common fine and medium concretions of calcium carbonate; about 5 percent limestone fragments 1/8 to 1 inch across; few worm channels; calcareous, moderately alkaline; clear wavy boundary.

A2—10 to 24 inches; dark grayish brown (2.5Y 4/2) clay, very dark grayish brown (2.5Y 3/2) moist; moderate fine granular and moderate medium subangular blocky structure; extremely hard, very firm, very sticky and plastic; common fine roots; common fine and medium concretions of calcium carbonate; about 5 percent limestone fragments 1/8 to 1 inch across; few worm channels; few intersecting slickensides; calcareous, moderately alkaline; gradual wavy boundary.

Bw—24 to 52 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate coarse angular blocky structure; extremely hard, very firm, very sticky and plastic; few fine roots; common fine and medium concretions of calcium carbonate; about 3 percent limestone fragments 1/8 to 1 inch across; few worm channels; common intersecting slickensides; calcareous, moderately alkaline; gradual wavy boundary.

Bk—52 to 70 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; common fine faint olive yellow mottles; moderate coarse angular blocky structure; extremely hard, very firm, very sticky and plastic; few fine roots; common fine and medium concretions and soft masses of calcium carbonate; about 3 percent limestone fragments 1/8 to 1 inch across; common intersecting slickensides; calcareous, moderately alkaline.

The solum ranges from 40 to more than 70 inches in thickness. Texture is clay or silty clay throughout the control section. Clay content is 40 to 60 percent. Intersecting slickensides begin at a depth of 16 to 24 inches (fig. 31). When the soil is dry, cracks 1 inch to 2 inches wide extend to a depth of more than 20 inches. Cycles of microridges and microvalleys are repeated every 10 to 22 feet prependicular to the slope. The soil is calcareous and moderately alkaline, but in some microvalleys, the upper 12 inches is noncalcareous and mildly alkaline or moderately alkaline. In more than half of each pedon, the calcium carbonate equivalent ranges from 40 to 60 percent in some parts of the 10- to 40-inch control section.

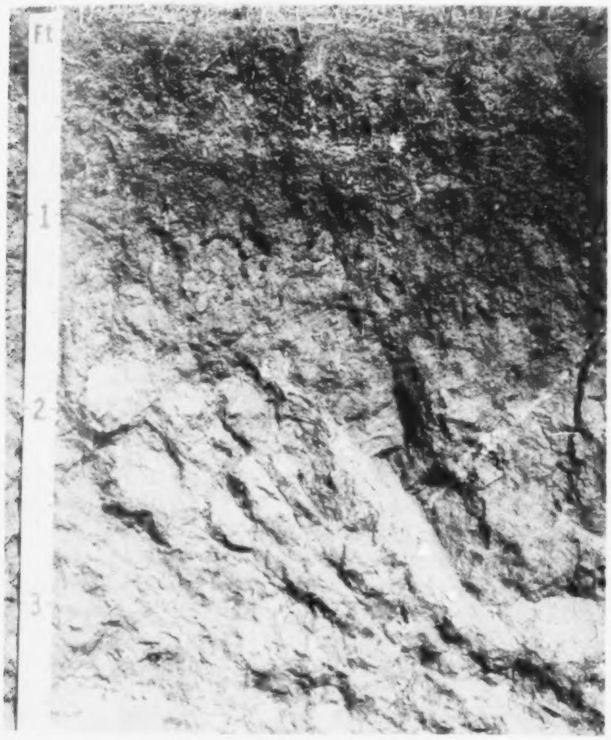

Figure 31.—Sanger clay has intersecting slickensides below a depth of 20 inches.

The A horizon is very dark grayish brown, dark gray, very dark gray, dark grayish brown, or grayish brown. Texture is clay or stony clay. A surface layer having moist chroma of less than 2 is less than 12 inches thick in more than half of each pedon.

The Bw horizon is grayish brown, dark grayish brown, brown, light brownish gray, light yellowish brown, or light olive brown clay. Fine or medium mottles in shades of brown or yellow range from few to common.

The Bk horizon is grayish brown, pale brown, light brownish gray, olive, light olive brown, yellowish brown, light yellowish brown, olive yellow, or very pale brown clay. Mottles in shades of gray, brown, or yellow range from few to common. Concretions and soft masses of calcium carbonate range from few to many throughout.

The C horizon is mottled in shades of brown, gray, and yellow. Texture is clay, silty clay, or shaly clay. Some pedons have remmants of limestone and platy, chalky fragments.

San Saba Series

The San Saba series consists of moderately deep, clayey soils on uplands. The soils formed in clayey sediment underlain by limestone. Slope ranges from 1 to 3 percent.

Typical pedon of San Saba clay, 1 to 3 percent slopes; from Farm Road 730 in Decatur, 10.6 miles south on U.S. Highway 81, 2.5 miles east on Farm Road 407, 0.54 mile north, and 150 feet west, in rangeland:

A1—0 to 11 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate medium angular blocky and moderate medium granular structure; very hard, very firm, very sticky and plastic; common roots; few wormcasts; few limestone fragments 1 centimeter across; few pitted concretions of calcium carbonate; common shiny pressure faces; calcareous, moderately alkaline; gradual wavy boundary.

A2—11 to 30 inches; very dark gray (10YR 3/1) clay, very dark gray (10YR 3/1) moist; moderate coarse blocky structure parting to strong fine blocky; extremely hard, very firm, very sticky and plastic; few fine roots mainly between peds; few fine fragments of limestone and concretions of calcium carbonate; common intersecting slickensides with grooved shiny faces; calcareous, moderately alkaline; gradual wavy boundary.

R—30 to 36 inches; hard fractured limestone.

The solum ranges from 24 to 40 inches to hard fractured limestone bedrock. Texture is clay. Clay content ranges from 45 to 60 percent. When the soil is dry, cracks 1 to 3 inches wide extend to a depth of more than 20 inches. Virgin, undisturbed areas have gilgai microrelief of microknolls 3 to 6 inches higher than microdepressions. Distance from center of the microknoll to center of the microdepression is 6 to 12 feet.

The Ap and A1 horizons are very dark gray or dark gray. Reaction is mainly calcareous and moderately alkaline, but in a few pedons, it is mildly alkaline.

The A2 horizon is very dark gray, dark gray, or dark grayish brown. It is calcareous and moderately alkaline.

The R horizon is coarsely fractured indurated limestone.

Selden Series

The Selden series consists of deep, sandy soils on uplands. The soils formed in loamy sediment. Slope ranges from 1 to 3 percent.

Typical pedon of Selden loamy fine sand, 1 to 3 percent slopes; from Farm Road 1655 in Alvord, 1 mile north on U.S. Highway 81; 3.9 miles west on a county road, 0.7 mile north, 0.6 mile west, and 200 feet south of county road:

A—0 to 5 inches; light yellowish brown (10YR 6/4) loamy fine sand, dark brown (10YR 4/3) moist; single grained; loose, very friable; common fine and medium roots; neutral; clear smooth boundary.

E—5 to 13 inches; very pale brown (10YR 7/4) loamy fine sand, yellowish brown (10YR 5/4) moist; single grained; loose, very friable; few fine and medium roots; neutral; clear smooth boundary.

Bt1—13 to 21 inches; brownish yellow (10YR 6/6) sandy clay loam, yellowish brown (10YR 5/6) moist; few fine distinct yellowish red mottles; weak medium subangular blocky structure; hard, firm; few fine roots; few fine and medium pores; common distinct clay films on faces of peds; slightly acid; clear wavy boundary.

Bt2—21 to 43 inches; brownish yellow (10YR 6/6) sandy clay loam, yellowish brown (10YR 5/6) moist; common medium distinct yellowish red (5YR 5/6) and light gray (10YR 7/2) mottles; weak medium subangular blocky structure; very hard, firm; few fine roots; common distinct clay films on faces of peds; few fine black concretions; few siliceous pebbles; strongly acid; gradual smooth boundary.

Bt3—43 to 58 inches; coarsely mottled brownish yellow (10YR 6/6), reddish yellow (7.5YR 6/6), strong brown (7.5YR 5/6), dark red (2.5YR 3/6), and light gray (10YR 7/2) sandy clay loam; weak medium prismatic structure parting to weak medium subangular blocky; very hard, firm; few fine roots; many thick gray clay films on faces of peds; few black concretions; few siliceous pebbles; strongly acid; gradual wavy boundary.

Bt4—58 to 70 inches; light gray (2.5Y 7/2) sandy clay loam, light brownish gray (10YR 6/2) moist, common coarse prominent strong brown (7.5YR 5/6), brownish yellow (10YR 6/6), and dark red (2.5YR 3/6) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; very hard, firm; few fine roots; many thick gray clay films on faces of peds; few siliceous pebbles; strongly acid.

The solum ranges from 60 to more than 80 inches in thickness. Clay content in the control section ranges from 20 to 35 percent.

The A and E horizons are slightly acid or neutral and range from 8 to 19 inches in thickness. The A horizon is pale brown, yellowish brown, light yellowish brown, or brown loamy fine sand. The E horizon is light yellowish brown or very pale brown loamy fine sand or fine sand.

The Bt1 and Bt2 horizons are brownish yellow, yellowish brown, reddish yellow, or yellowish red and have few to common mottles in shades of red and gray. The Bt3 and Bt4 horizons are coarsely mottled in yellow, light gray, red, dark red, pale brown, reddish yellow, yellowish red, brownish yellow, or strong brown, or they are light gray and have medium or coarse mottles in shades of brown, yellow, or red. Texture is sandy clay loam or clay loam. Reaction ranges from strongly acid to slightly acid.

Set Series

The Set series consists of deep, well drained, clayey and stony soils on uplands. The soils formed in colluvial clayey and loamy sediment deposited over clayey and shaly material. Slope ranges from 8 to 30 percent.

Typical pedon of Set very stony silty clay, 8 to 30 percent slopes; from Texas Highway 101 in Bridgeport, 3.6 miles west on U.S. Highway 380, 1 mile north and west on Farm Road 1820, 0.3 mile north and 1,050 feet west of county road, and 100 feet south of a cove of Lake Bridgeport:

A—0 to 11 inches; dark grayish brown (10YR 4/2) very stony silty clay, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; hard, firm; many fine and few medium and coarse roots; common wormcasts; limestone fragments dominantly 10 to 40 inches across and 3 to 8 inches thick on about 8 percent of surface; about 20 percent, by volume, limestone fragments 0.1 inch to 10 inches across; calcareous, moderately alkaline; clear smooth boundary.

Bk1—11 to 16 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate fine and very fine subangular blocky structure; hard, firm; common fine and few medium roots; common fine and medium pores; common wormcasts; common concretions and soft masses of calcium carbonate; about 10 percent limestone fragments less than 0.5 inch in diameter, about 2 percent limestone fragments 1 to 8 inches across; calcareous, moderately alkaline; gradual smooth boundary.

Bk2—16 to 38 inches; light yellowish brown (10YR 6/4) silty clay loam, yellowish brown (10YR 5/4) moist; moderate fine and very fine subangular blocky structure; hard, firm; common fine and few medium roots; few fine pores; common wormcasts; common concretions and soft masses of calcium carbonate; calcareous, moderately alkaline; gradual smooth boundary.

BCk—38 to 54 inches; light yellowish brown (10YR 6/4) silty clay loam, yellowish brown (10YR 5/4) moist; moderate fine and medium subangular blocky structure; hard, firm; few fine and medium roots; few fine pores; few wormcasts; many concretions and soft masses of calcium carbonate; about 35 percent, by volume, partly weathered shale fragments; calcareous, moderately alkaline; diffuse wavy boundary.

C—54 to 64 inches; pale olive (5Y 6/3) shaly clay, olive (5Y 5/3) moist; common light gray (10YR 7/1) streaks and mottles; massive; extremely hard, very firm; few fine roots; few concretions of calcium carbonate; calcareous, moderately alkaline.

The solum is 40 to 60 inches thick. The 10- to 40-inch control section is clay, silty clay, or silty clay loam. The calcium carbonate equivalent is more than 40 percent. Silicate clay content ranges from 20 to 35 percent. Fragments of limestone cover 5 to 20 percent of the soil surface. The fragments are as much as 48 inches across their long axis and 3 to 8 inches thick. Few to common fine fragments and a few coarse fragments are throughout the soil.

The A horizon is brown, dark brown, very dark grayish brown, or dark grayish brown. It is 10 to 19 inches thick.

The Bk and BCk horizons are pale brown, light brownish gray, brown, light yellowish brown, light olive brown, yellowish brown, or olive. Concretions and soft masses of calcium carbonate range from common to many.

The C horizon is shades of olive, brown, or gray. It is shaly clay or shaly clay interbedded with clayey and loamy material. Concretions and soft masses of calcium carbonate range from few to common and decrease with depth.

Silawa Series

The Silawa series consists of deep, loamy soils on stream terraces. The soils formed in loamy and sandy sediment. Slope ranges from 3 to 8 percent.

Typical pedon of Silawa fine sandy loam, 3 to 8 percent slopes; from U.S. Highway 380 in west Decatur, 6.1 miles southwest on Farm Road 51 and 75 feet east of road:

A—0 to 4 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak medium subangular blocky and fine granular structure; slightly hard, very friable; many fine roots and fine pores; slightly acid; clear smooth boundary.

E—4 to 12 inches; light yellowish brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky and weak fine granular structure; slightly hard, very friable; many fine and medium roots; many fine pores; slightly acid; abrupt smooth boundary.

Bt1—12 to 28 inches; red (2.5YR 5/6) loam, red (2.5YR 4/6) moist; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; very hard, firm; common fine and medium roots; common fine pores; common distinct clay films, 1 chroma darker than soil matrix, on faces of peds; medium acid; gradual wavy boundary.

Bt2—28 to 46 inches; yellowish red (5YR 5/8) sandy clay loam, yellowish red (5YR 5/8) moist; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; very hard, friable; common fine roots; common fine pores; few thin patchy clay films on faces of peds and bridging sand grains; slightly acid; gradual wavy boundary.

Bt3—46 to 59 inches; reddish yellow (5YR 6/8) fine sandy loam, yellowish red (5YR 5/8) moist; weak medium prismatic structure parting to weak medium and coarse subangular blocky; hard, friable; common fine roots; common fine and very fine pores; few thin patchy clay films on faces of peds and bridging sand grains; slightly acid; gradual wavy boundary.

BC—59 to 80 inches; reddish yellow (5YR 6/6) fine sandy loam, yellowish red (5YR 5/6) moist; weak fine and very fine subangular blocky and granular structure; slightly hard, very friable; few fine roots; few fine pores; neutral; clear irregular boundary.

The solum is more than 40 inches thick. The clay content in the control section ranges from 18 to 35 percent. Siliceous pebbles range from 0 to 10 percent throughout the A, E, and Bt horizons.

The A horizon is brown, grayish brown, pale brown, dark yellowish brown, light yellowish brown, or light brown fine sandy loam. Reaction is medium acid or slightly acid.

The E horizon is light yellowish brown, brown, light brown, pale brown, and yellowish brown fine sandy loam or loamy fine sand. Reaction is slightly acid or neutral. Combined thickness of the A and E horizons is 4 to 20 inches.

The Bt horizon is red, yellowish red, reddish yellow, strong brown, or reddish brown loam, sandy clay loam, or fine sandy loam. Reaction is medium acid or slightly acid.

The BC horizon is shades of red, brown, or yellow. Texture is fine sandy loam, sandy clay loam, or gravelly fine sandy loam. Siliceous pebbles range from 0 to 30 percent, by volume. Reaction ranges from medium acid to neutral.

The C horizon is shades of brown, yellow, or red. Texture is loamy fine sand, fine sandy loam, loamy sand, or their gravelly analogs. Reaction ranges from slightly acid to moderately alkaline. Some pedons are calcareous.

The Silawa soils in Wise County are taxadjuncts to the Silawa series. They are slightly less acid in the argillic horizon than typical Silawa soils. This survey area is in the extreme western part of the province of the Silawa series. Interpretations, nevertheless, are essentially the same.

Slidell Series

The Slidell series consists of deep, clayey, cyclic soils on uplands. The soils formed in alkaline marine sediment. Slope ranges from 0 to 3 percent.

Typical pedon of Slidell clay, 1 to 3 percent slopes; from U.S. Highway 81 on south side of Rhome, 3.6 miles east on Texas Highway 114, 0.3 mile north on a private road, and 500 feet west, in a field:

Ap—0 to 9 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate very fine granular and moderate fine subangular blocky structure; extremely hard, very firm, very sticky and plastic; many fine and medium roots; many fine pores; common fine concretions of calcium carbonate; calcareous, moderately alkaline; abrupt smooth boundary.

A1—9 to 18 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium angular blocky structure; extremely hard, very firm, very sticky and plastic; common fine roots; common fine pores; common fine concretions of calcium carbonate; calcareous, moderately alkaline; gradual wavy boundary.

A2—18 to 50 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate coarse angular blocky structure; extremely hard, very firm, very sticky and plastic; few fine roots; few fine pores; common fine and medium concretions of calcium carbonate; common intersecting slickensides; calcareous, moderately alkaline; gradual wavy boundary.

Bw—50 to 70 inches; dark grayish brown (2.5Y 4/2) clay, very dark grayish brown (2.5Y 3/2) moist; moderate coarse angular blocky structure; extremely hard, very firm, very sticky and plastic; few fine roots; few fine pores; common fine and medium concretions of calcium carbonate; few fine black concretions; common intersecting slickensides; calcareous, moderately alkaline; gradual wavy boundary.

Bk—70 to 80 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; common medium distinct light yellowish brown (10YR 6/4) and brownish yellow (10YR 6/6) mottles; moderate coarse angular blocky structure; extremely hard, very firm, very sticky and plastic; few fine pores; few wormcasts; many fine and medium concretions and soft masses of calcium carbonate; few fine black concretions; few intersecting slickensides; calcareous, moderately alkaline; gradual wavy boundary.

The solum ranges from 60 to more than 80 inches in thickness. The texture is silty clay or clay throughout. Clay content ranges from 40 to 60 percent. When the soil is dry, cracks 1 to 3 inches wide extend to a depth of more than 20 inches. Intersecting slickensides begin at a depth of 16 to 25 inches. In more than half of each pedon the calcium carbonate equivalent is from 40 to 60 percent in some parts of the 10- to 40-inch control section. Cycles of microdepressions and microknolls occur every 10 to 20 feet. In native areas, the microknolls are 3 to 16 inches higher than the microdepressions. The soil is calcareous and moderately alkaline, but in some microdepressions, the upper 12 inches is noncalcareous and is mildly alkaline or moderately alkaline.

The A horizon is very dark gray or dark gray.

The Bw horizon is dark gray, gray, dark grayish brown, grayish brown, brown, or light yellowish brown. Mottles of olive brown, brown, yellowish brown, or brownish yellow range from none to common. The Bk horizon is grayish brown, brown, light yellowish brown, very pale brown, or pale yellow. Mottles of dark grayish brown, yellowish brown, grayish brown, brownish yellow, or yellow range from few to common.

Some pedons have a C horizon. It is pale brown or light yellowish brown and is mottled in olive brown, gray, brownish yellow, olive yellow, or yellow. In some pedons, fragments of limestone are interbedded with marly silty clay or silty clay loam.

Somervell Series

The Somervell series consists of moderately deep, loamy and gravelly soils on uplands. The soils formed in fractured shell imbedded limestone strata that are interbedded with layers of loamy and clayey marls. Slope ranges from 1 to 8 percent.

Typical pedon of Somervell very gravelly loam, in an area of Somervell-Aledo complex, 1 to 8 percent slopes; from U.S. Highway 380 in northeast Decatur, 6 miles northeast on Farm Road 51, 4.7 miles east on a county road, 0.2 mile northeast on ranch road, and 50 feet south, in rangeland:

A—0 to 10 inches; dark brown (10YR 4/3) very gravelly loam, dark brown (10YR 3/3) moist; strong fine granular structure; hard, friable; many fine, medium, and coarse roots; many wormcasts; about 37 percent, by volume, shell imbedded limestone fragments mostly less than 3 inches across; about 5 percent, by volume, limestone fragments 3 to 8 inches across; calcareous, moderately alkaline; clear wavy boundary.

Bk1—10 to 25 inches; brown (10YR 5/3) very gravelly loam, dark brown (10YR 4/3) moist; strong fine granular structure; hard, friable; many fine and medium roots; common streaks and few soft masses of calcium carbonate; common wormcasts; about 50 percent, by volume, shell imbedded limestone fragments mainly less than 8 inches across; calcareous, moderately alkaline; gradual irregular boundary.

Bk2—25 to 37 inches; light yellowish brown (2.5Y 6/4) very gravelly loam, light olive brown (2.5Y 5/4) moist; few fine roots; common wormcasts; common fine and medium concretions and large soft masses of calcium carbonate; about 40 percent, by volume, soft weathered limestone fragments; about 20 percent, by volume, pale yellow platy marl; calcareous, moderately alkaline; abrupt smooth boundary.

R—37 to 45 inches; indurated coarsely fractured limestone; fossil shells with interbedded layers of weakly cemented limestone and clayey and loamy marly material; fractures 6 to about 12 inches apart filled with roots and soil material.

The solum is 20 to 40 inches thick. Calcium carbonate equivalent in the control section is 40 to about 80 percent.

The A horizon is dark brown, dark grayish brown, or grayish brown very gravelly loam. Limestone gravel, cobbles, and shell fragments range from 35 to 75 percent. The A horizon is 10 to 20 inches thick.

The Bk horizon is brown, pale brown, light brownish gray, or light yellowish brown. Texture is very gravelly loam or very gravelly clay loam that is 35 to 85 percent limestone gravel, cobbles, and shell fragments. A stone line 2 to 6 inches thick is in some pedons.

The R layer is fractured indurated limestone that has many fossil shells interbedded with layers of weakly cemented limestone and layers of yellowish, brownish, and grayish clayey and loamy marly material.

Speck Series

The Speck series consists of shallow, loamy soils on uplands. The soils formed in clayey material weathered from indurated limestone. Slope ranges from 0 to 2 percent.

Typical pedon of Speck clay loam, 0 to 2 percent slopes; from U.S. Highway 380 in Decatur, 11 miles northeast on Texas Highway 51, and 50 feet northwest of highway, in rangeland:

A—0 to 4 inches; dark brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; moderate fine subangular blocky structure; very hard, firm, sticky and plastic; common fine and medium roots; few wormcasts and channels; few fine fragments of limestone; few fine black concretions; mildly alkaline; clear smooth boundary.

Bt—4 to 16 inches; dark reddish gray (5YR 4/2) clay, dark reddish brown (5YR 3/2) moist; moderate fine blocky structure; extremely hard, very firm, very sticky and plastic; common fine and medium roots; few wormcasts and channels; common clay films on faces of peds; few fine angular and subrounded pebbles of limestone in lower 2 inches; mildly alkaline; abrupt wavy boundary.

R—16 to 24 inches; limestone bedrock, fractured in upper part; soil material in fractures; calcium carbonate coatings and roots in fractures; hardness of 3 or more on Mohs scale.

Thickness of the solum and depth to limestone bedrock range from 14 to 20 inches.

The A horizon is dark grayish brown, reddish brown, dark brown, or brown clay loam. Reaction is slightly acid to mildly alkaline. The A horizon is 4 to 9 inches thick.

The Bt horizon is reddish brown, dark reddish gray, or dark reddish brown clay. Clay content ranges from 40 to 60 percent. Calcium carbonate coatings are on the surface of fragments and in fractures. Soil reaction ranges from neutral to moderately alkaline.

The R layer is hard limestone that has fractures in the upper part. Soil material and roots are in the fractures. Fractures are spaced 6 to about 14 inches apart.

The Speck soils in Wise County are taxadjuncts to the Speck series. They have montmorillonitic clay mineralogy. However, use and behavior of these soils are similar to other soils in the Speck series.

Thurber Series

The Thurber series consists of deep, loamy soils on uplands. The soils formed in calcareous clayey outwash. Slope ranges from 1 to 3 percent.

Typical pedon of Thurber clay loam, 1 to 3 percent slopes; from Texas Highway 101 in Bridgeport, 9 miles west on U.S. Highway 380, 1.9 miles north and 0.6 mile west on a county road, and 100 feet north of road:

A—0 to 6 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; very hard, firm; many fine roots; slightly acid; clear wavy boundary.

Bt1—6 to 16 inches; dark brown (10YR 4/3) clay, dark brown (10YR 3/3) moist; moderate medium blocky structure; very hard, very firm; common fine roots; continuous distinct clay films on faces of peds; neutral; clear wavy boundary.

Bt2—16 to 42 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; moderate medium blocky structure; very hard, very firm; few fine roots; continuous distinct clay films on faces of peds; common fine and medium concretions of calcium carbonate; few medium black concretions; moderately alkaline; calcareous, gradual wavy boundary.

BCk—42 to 52 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; weak fine blocky structure; hard, friable; few fine roots; few fine pores; few wormcasts; few patchy clay films; common threads, fine concretions, and soft mottles of calcium carbonate; moderately alkaline, calcareous; gradual smooth boundary.

C—52 to 62 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; common medium distinct olive yellow (2.5Y 6/6) mottles; massive; few films, threads, and fine concretions of calcium carbonate; common angular fragments of shale; moderately alkaline, calcareous.

The solum ranges from 40 to 60 inches in thickness. Depth to films, threads, concretions, or soft masses of calcium carbonate ranges from 15 to 28 inches.

The A horizon is grayish brown, brown, dark grayish brown, or light olive brown clay loam. The reaction is slightly acid to mildly alkaline. The A horizon is hard and massive when dry. It is 4 to 12 inches thick.

The Bt horizon is dark grayish brown, very dark grayish brown, brown, dark brown, yellowish brown, grayish brown, olive brown, or light olive brown. Texture is clay or clay loam. Reaction is neutral to moderately alkaline.

The BCk and C horizons are calcareous clay or clay loam in shades of brown and gray. Some pedons have fragments of shale. Clay content ranges from 35 to 55 percent. Concretions and soft masses of calcium carbonate range from common to many in the BCk horizon and from none to a few in the C horizon.

Trinity Series

The Trinity series consists of deep, clayey soils on flood plains. The soils formed in clayey alluvial sediment. Slope is 0 to 1 percent.

Typical pedon of Trinity clay, occassionally flooded; from Farm Road 51 in northest Decatur, 9 miles east on U.S. Highway 380, 1.3 miles north on a county road to Allison Community, 0.9 mile northeast to Denton Creek channel, 700 feet east of creek channel, and 100 feet south of road, in a pasture:

Ap—0 to 6 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate fine subangular blocky structure; extremely hard, very firm, very sticky and plastic; moderate fine granular mulch on surface; many fine roots; few wormcasts; few fine calcium carbonate concretions; calcareous, moderately alkaline; abrupt smooth boundary.

A1—6 to 60 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium angular blocky structure; extremely hard, very firm, very sticky and plastic; common fine roots; few fine pores; few wormcasts; few fine concretions of calcium carbonate; common intersecting slickensides below a depth of 24 inches; old cracks filled with soil from Ap horizon; calcareous, moderately alkaline; diffuse wavy boundary.

A2—60 to 80 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate coarse angular blocky structure; extremely hard, very firm, very sticky and plastic; few fine roots; few fine pores; few wormcasts; common fine concretions of calcium carbonate; few fine black concretions; common intersecting slickensides; old cracks filled with soil from A1 horizon; calcareous, moderately alkaline.

The solum ranges from 60 to more then 80 inches in thickness. Clay content is 60 to 75 percent. When the soil is dry, cracks 1 to 4 inches wide extend to a depth of more than 20 inches. Intersecting slickensides begin at a depth of more than 24 inches. Cycles of microdepressions and microknolls are present. In undisturbed areas, microknolls are 2 to 6 inches higher than microdepressions. The soil is calcareous and moderately alkaline throughout.

The A horizon is very dark gray or dark gray clay. Below a depth of 40 inches, mottles in shades of brown or yellow range from none to common. Below the control section some pedons are gray or dark grayish brown.

Truce Series

The Truce series consists of deep, loamy soils on uplands. The soils formed in material weathered from shale. Slope ranges from 1 to 5 percent.

Typical pedon of Truce fine sandy loam, 3 to 5 percent slopes; from U.S. Highway 380 in Bridgeport, 0.5 mile north on Texas Highway 101, 0.2 mile west on unpaved county road, 0.6 mile northwest on a private road, and 100 feet north, in rangeland:

A—0 to 7 inches; dark brown (7.5YR 4/4) fine sandy loam, dark brown (7.5YR 3/2) moist; weak fine and very fine subangular blocky structure; very hard, friable; many fine roots; neutral; abrupt smooth boundary.

Bt1—7 to 21 inches; yellowish red (5YR 4/6) clay, dark reddish brown (5YR 3/4) moist; moderate fine and medium blocky structure; extremely hard, very firm; common roots; common thin continuous clay films on faces of peds; slightly acid; gradual wavy boundary.

Bt2—21 to 30 inches; dark yellowish brown (10YR 4/6) clay, dark yellowish brown (10YR 3/6) moist; moderate fine and medium blocky structure; extremely hard, very firm; few fine roots; common thin continuous clay films on faces of peds; few fine black concretions; neutral; gradual wavy boundary.

Bt3—30 to 44 inches; yellowish brown (10YR 5/6) clay; yellowish brown (10YR 5/6) moist; extremely hard, very firm; few fine roots mainly between peds; common thin continuous clay films on faces of peds; common fine black concretions; few siliceous pebbles; neutral; clear wavy boundary.

BCk—44 to 51 inches; light yellowish brown (2.5Y 6/4) shaly clay, light yellowish brown (2.5Y 6/4) moist;

moderate medium blocky to somewhat platy structure; extremely hard, very firm; few fine roots, few thin clay films on faces of blocky peds; common fine concretions and soft masses of calcium carbonate; few siliceous pebbles; calcareous, moderately alkaline; clear wavy boundary.

C—51 to 80 inches; light gray (2.5Y 7/2) very shaly clay; light brownish gray (2.5Y 6/2) moist; massive; common cleavage planes; brittle; few fine concretions and soft masses of calcium carbonate; calcareous, moderately alkaline.

The solum ranges from 40 to 60 inches in thickness. The clay content of the Bt horizon ranges from 35 to 55 percent. Fragments of ironstone and sandstone less than 10 inches across make up 0 to 5 percent, by volume.

The A horizon is brown, dark brown, yellowish brown, or dark grayish brown fine sandy loam. Reaction is slightly acid or neutral. The A horizon is 2 to 7 inches thick.

Some pedons have an E horizon. It is light brownish gray, pale brown, light yellowish brown, or brown fine sandy loam. Reaction is slightly acid or neutral. The E horizon ranges up to 7 inches thick.

The Bt1 horizon is reddish brown, red, or yellowish red clay or clay loam. Reaction ranges from slightly acid to mildly alkaline.

The Bt2 and Bt3 horizons are brown, yellowish brown, brownish yellow, dark yellowish brown, reddish brown, or reddish yellow clay. Reaction is neutral to moderately alkaline.

The BCk horizon is shades of brown or olive, and some pedons have mottles in shades of brown or olive. Texture is clay or shaly clay. Reaction is mildly alkaline or moderately alkaline, and most pedons are calcareous. Concretions and soft masses of calcium carbonate range from none to common.

The C horizon is shades of olive, brown, yellow, and gray. Texture is shaly clay or very shaly clay. Some pedons have thin, discontinuous layers of sandstone. Reaction is mainly moderately alkaline and calcareous, but a few pedons are mildly alkaline and noncalcareous.

Venus Series

The Venus series consists of deep, loamy soils on uplands. The soils formed in loamy alkaline material on colluvial foot slopes and on stream terraces. Slope ranges from 1 to 8 percent.

Typical pedon of Venus loam, 3 to 8 percent slopes; from U.S. Highway 380 in northeast Decatur, 10.85 miles northeast on Farm Road 51, 1.45 miles south on a county road, 1,100 feet southeast on a private ranch road, and 280 feet southwest of private road:

A—0 to 14 inches; dark brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; moderate fine granular and fine subangular blocky structure; hard, friable; common fine roots; few wormcasts; common fine and medium pores; few shell and limestone fragments up to 5 millimeters across; calcareous, moderately alkaline; gradual smooth boundary.

Bk1—14 to 30 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; hard, friable; few fine roots; few wormcasts; common fine and medium pores; few threads, masses, and concretions of calcium carbonate; common shell and limestone fragments up to 7 millimeters across; calcareous, moderately alkaline; gradual smooth boundary.

Bk2—30 to 52 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; moderate fine and medium subangular blocky structure; hard, friable; few fine roots; few wormcasts; few fine pores; common masses, threads, and concretions of calcium carbonate; common shell and limestone fragments up to 7 millimeters across; calcareous, moderately alkaline; gradual smooth boundary.

BCk—52 to 70 inches; light yellowish brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky structure; hard, friable; few fine pores; many threads, masses, and common concretions of calcium carbonate; common limestone fragments up to 2 centimeters across; calcareous, moderately alkaline.

The solum ranges from 60 to about 80 inches in thickness. Silicate clay content ranges from 18 to 30 percent in the control section. The soil is moderately alkaline and calcareous throughout.

The A horizon is brown, grayish brown, dark grayish brown, or dark brown loam. It is 10 to 20 inches thick.

The Bk horizon is grayish brown, light brownish gray, very pale brown, pale brown, brown, light brown, pink, light yellowish brown, or yellowish brown. Texture is loam, sandy clay loam, or clay loam. Calcium carbonate equivalent ranges form 15 to 40 percent (fig. 32).

The BCk horizon is brown, light brown, light yellowish brown, very pale brown, reddish yellow, or brownish yellow. Texture is fine sandy loam, loam, sandy clay loam, or clay loam. The calcium carbonate equivalent ranges from 10 to 60 percent. Some pedons are underlain by layers of sand and gravel at a depth of 4 to 8 feet.

Vernon Series

The Vernon series consists of moderately deep, clayey soils on uplands. The soils formed in calcareous clayey material. Slope ranges from 3 to 8 percent.

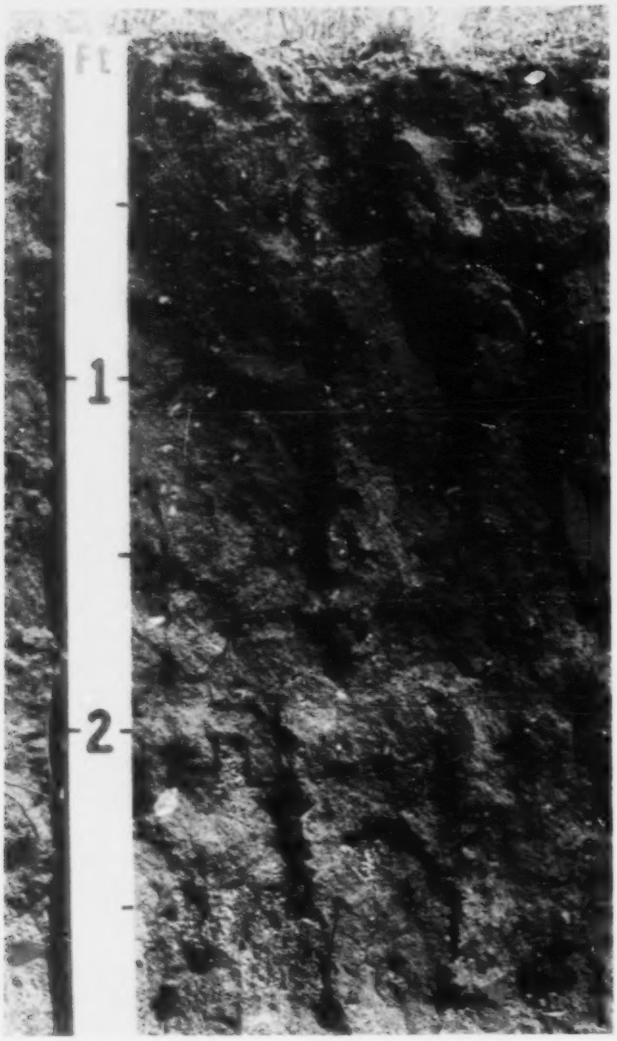

Figure 32.—Concretions and threads of calcium carbonate (lime) are common below the dark surface layer of Venus loam. High content of calcium carbonate causes farm ponds to seep.

Typical pedon of Vernon clay, 3 to 8 percent slopes; from Texas Highway 114 in Bridgeport, 7.7 miles south on Farm Road 920, 2 miles east on a county road, 0.2 mile south and 100 feet west of road, in rangeland:

A—0 to 4 inches; reddish brown (5YR 5/3) clay, reddish brown (5YR 4/3) moist; moderate fine subangular blocky structure; very hard, very firm, very sticky and plastic; common fine and medium roots; few fine pores; few very fine and fine concretions of calcium carbonate; calcareous, moderately alkaline; clear smooth boundary.

Bw—4 to 16 inches; reddish brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) moist; moderate fine and medium blocky structure; very hard, very firm, very sticky and plastic; common fine roots; few fine pores; few concretions of calcium carbonate; calcareous, moderately alkaline; gradual smooth boundary.

Bk—16 to 32 inches; red (10R 4/6) clay, red (10R 4/6) moist; weak fine and medium blocky structure; very hard, very firm, very sticky and plastic; common concretions and masses of calcium carbonate; few particles of clayey shale; calcareous, moderately alkaline; diffuse smooth boundary.

C—32 to 60 inches; weak red (10R 5/4) shaly clay; spots and strata of gray and pale red; massive; very hard, very firm, very sticky and plastic; few fine roots; few concretions and soft masses of calcium carbonate; calcareous, moderately alkaline.

The solum ranges from 20 to 40 inches in thickness. Typically the soil is moderately alkaline and calcareous throughout, but a few pedons are noncalcareous in the upper few inches.

The A horizon is reddish brown or brown clay. It is 4 to 12 inches thick.

The Bw and Bk horizons are reddish brown, red, or weak red clay. The Bk horizon has up to 10 percent calcium carbonate in the form of films, threads, soft masses, and concretions.

The C horizon is weak red, pale red, reddish brown, or red shaly clay. Some pedons have gray mottles and thin strata in shades of gray. Most pedons have few to common soft masses and concretions of calcium carbonate.

Weatherford Series

The Weatherford series consists of deep, loamy soils on uplands. The soils formed in weakly cemented sandstone (fig. 33). Slope ranges from 3 to 8 percent.

Typical pedon of Weatherford very fine sandy loam, in an area of Weatherford-Duffau complex, 3 to 8 percent slopes; from U.S. Highway 81 in Decatur, 1 mile west on U.S. Highway 380, and 50 feet south of highway:

A—0 to 6 inches; brown (10YR 5/3) very fine sandy loam, dark brown (10YR 4/3) moist; weak fine subangular blocky and weak medium granular structure; hard, very friable; many fine roots; few fine and medium pores; few wormcasts and channels; neutral; clear smooth boundary.

E—6 to 11 inches; brown (7.5YR 5/4) very fine sandy loam, dark brown (7.5YR 4/4) moist; weak fine subangular blocky and weak medium granular structure; hard, very friable; many fine roots; few fine

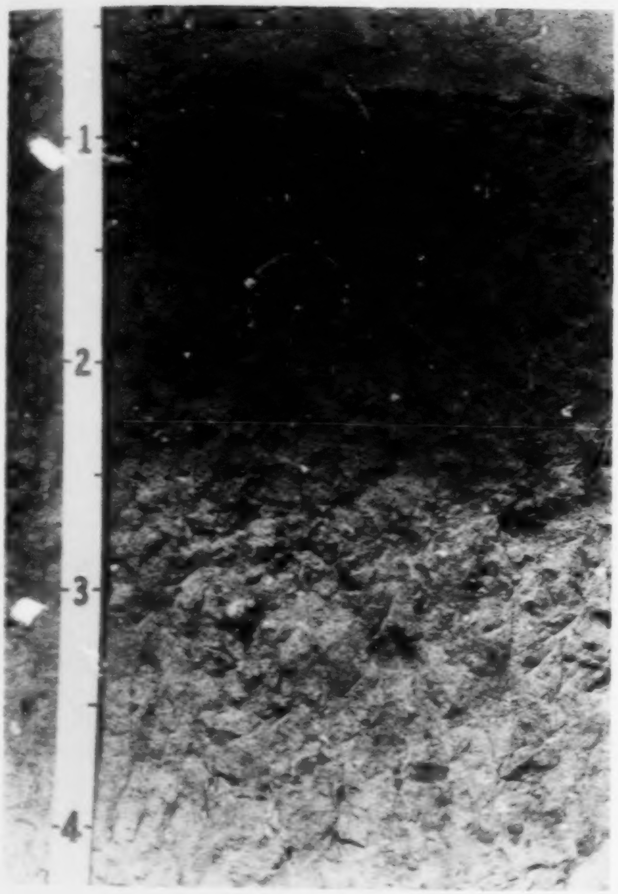

Figure 33.—In Weatherford fine sandy loam, weakly cemented packsand is at a depth of 47 inches.

pores; few wormcasts and channels; neutral; abrupt smooth boundary.

Bt1—11 to 25 inches; red (2.5YR 5/6) sandy clay loam, red (2.5YR 4/6) moist; weak fine and medium subangular blocky structure; very hard, firm; few fine roots; few fine and medium pores; few wormcasts and channels; common distinct clay films 1 chroma less than soil matrix; strongly acid; gradual smooth boundary.

Bt2—25 to 47 inches; yellowish red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) moist; moderate medium prismatic structure parting to weak medium subangular blocky; very hard, firm; few fine roots; few fine and medium pores; few wormcasts and channels; common distinct clay films 1 chroma less than soil matrix; few clean sand grains on prism faces; slightly acid; clear wavy boundary.

Cr—47 to 80 inches; reddish yellow (7.5YR 7/6 and 5YR 6/8) weakly cemented sandstone, reddish yellow (7.5YR 6/6) and yellowish red (5YR 5/8) moist; massive; hard when dry, friable upon moistening; few reddish clay films in fractures in upper part; slightly acid.

The solum ranges from 40 to 60 inches in thickness.

The A horizon is brown, dark brown, grayish brown, yellowish brown, or pale brown. Texture is fine sandy loam or very fine sandy loam. Reaction is slightly acid or neutral. The A horizon is 3 to 8 inches thick.

The E horizon is brown, light brown, pinkish gray, pale brown, or light yellowish brown fine sandy loam or very fine sandy loam. Reaction is slightly acid or neutral. The E horizon is 2 to 10 inches thick.

The Bt horizon is red, reddish brown, reddish yellow, or yellowish red. Mottles in shades of brown, yellow, or red are in the lower part of some pedons. Texture is sandy clay loam that is 20 to 35 percent clay in the control section. Fine sandy loam is in the lower part of some pedons. Reaction ranges from strongly acid to slightly acid.

The Cr horizon is white, pink, or shades of red or yellow, stratified weakly cemented sandstone. The sandstone is hard to very hard when dry, but is slightly hard or friable when moist. Reaction ranges from medium acid to neutral.

Westfork Series

The Westfork series consists of deep, clayey soils on flood plains. The soils formed in recent clayey alluvial sediment high in silt. Slope is 0 to 1 percent.

Typical pedon of Westfork silty clay, occasionally flooded; from Texas Highway 114 in Bridgeport, 1.3 miles west and southwest on Farm Road 920, and 2,000 feet west on flood plain of the West Fork of the Trinity River:

A1—0 to 8 inches; brown (10YR 5/3) silty clay, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; very hard, firm; common fine and medium roots; common fine pores; few wormcasts and channels; neutral; clear smooth boundary.

A2—8 to 31 inches; dark brown (7.5YR 4/2) silty clay, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; extremely hard, very firm; few fine roots; few fine pores; common small pressure faces; mildly alkaline; gradual smooth boundary.

Bw—31 to 43 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; few fine faint dark yellowish brown mottles; moderate medium subangular blocky structure; very hard, firm; few fine roots; few fine pores; few very fine concretions of calcium carbonate; noncalcareous, moderately alkaline.

Ab—43 to 80 inches; very dark grayish brown (10YR 3/2) silty clay loam, very dark brown (10YR 2/2) moist; moderate fine and medium subangular blocky structure; very hard, firm; few fine roots; mildly alkaline.

The solum is more than 60 inches thick. The mollic epipedon is more than 20 inches thick. Cracks up to 1.5 inches wide at the surface extend to a depth of about 18 inches. The COLE is less than 0.07. The control section ranges from 40 to 60 percent clay.

The A horizon is brown, dark grayish brown, or dark brown silty clay. Reaction is neutral or mildly alkaline.

The Bw horizon is dark grayish brown or very dark grayish brown silty clay and has few to common mottles in shades of brown or yellow. Reaction is mildly alkaline or moderately alkaline and calcareous.

A buried horizon is below a depth of 40 inches in some pedons. It is very dark grayish brown or dark grayish brown silty clay loam. Reaction is mildly alkaline or moderately alkaline and calcareous.

Windthorst Series

The Windthorst series consists of deep, loamy soils on erosional uplands. The soils formed in stratified clayey and loamy material. Slope ranges from 1 to 6 percent.

Typical pedon of Windthorst fine sandy loam, 1 to 5 percent slopes; from Texas Highway 114 in Bridgeport, 4.3 miles south on Farm Road 2123, 1.7 miles east on a county road, 0.2 mile north and 30 feet east of county road:

A—0 to 4 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine granular structure; soft, very friable; many fine and medium and few coarse roots; neutral; clear smooth boundary.

E—4 to 10 inches; light yellowish brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky structure; slightly hard, very friable; common fine and medium and few coarse roots; neutral; abrupt smooth boundary.

Bt1—10 to 23 inches; red (2.5YR 4/6) clay, dark red (2.5YR 3/6) moist; moderate fine and medium blocky structure (fig. 34); extremely hard, very firm; common fine and medium roots; thick continuous dark reddish brown clay films on faces of peds; medium acid; gradual smooth boundary.

Bt2—23 to 34 inches; reddish brown (5YR 5/4) sandy clay, reddish brown (5YR 4/4) moist; common medium distinct reddish yellow (7.5YR 6/6) and dark red (2.5YR 3/6) mottles; moderate medium blocky structure; very hard, firm; few fine roots; common distinct reddish brown clay films on faces of peds; medium acid; gradual wavy boundary.

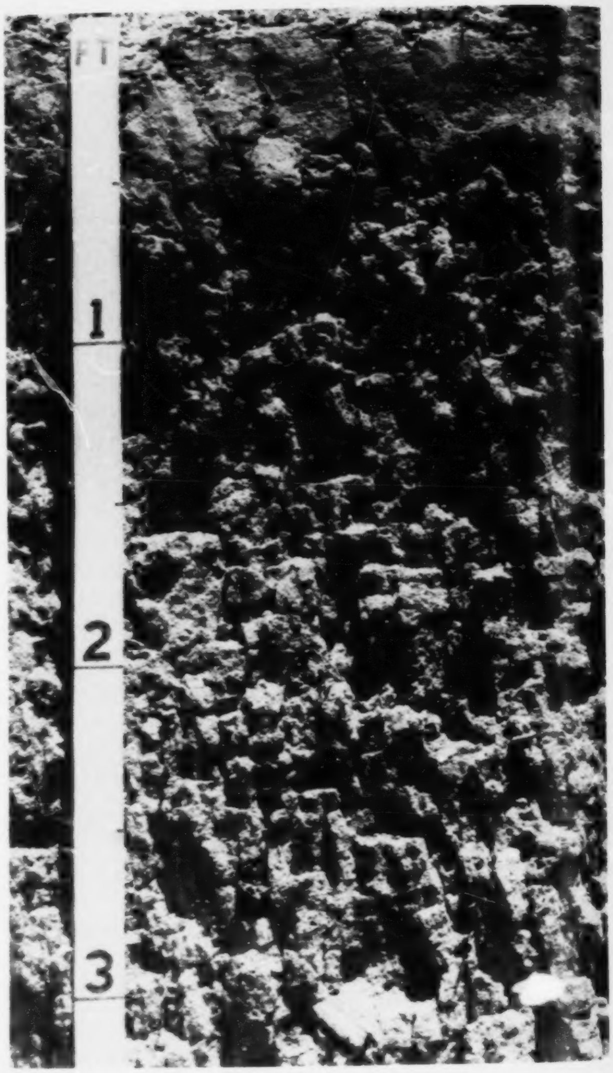

Figure 34.—The subsoil of Windthorst fine sandy loam has good blocky structure.

BC—34 to 45 inches; reddish yellow (7.5YR 6/6) sandy clay loam, strong brown (7.5YR 5/6) moist; common medium distinct red (2.5YR 4/6) and brownish yellow (10YR 6/8) mottles; moderate medium prismatic structure; hard, firm; few fine roots; few thin patchy reddish brown clay films on faces of peds and thick clay films in root channels; few weakly cemented sandstone fragments less than 1 inch across; slightly acid; gradual wavy boundary.

C—45 to 60 inches; light gray (2.5Y 7/2) clay loam, light brownish gray (2.5Y 6/2) moist; common fine and medium distinct reddish yellow (7.5YR 6/8) and brownish yellow (10YR 6/6) mottles; massive; slightly brittle; few fine roots and clay flows in fractures and crevices; common fine dark stains; few thin discontinuous layers of weakly cemented sandstone and soft shale; neutral.

The solum ranges from 40 to 60 inches in thickness. Siliceous or ironstone pebbles range from 0 to 5 percent, by volume, in some horizons. The average clay content in the control section ranges from 35 to 45 percent.

The A horizon is dark grayish brown, grayish brown, brown, dark brown, yellowish brown, or pale brown fine sandy loam. Reaction ranges from medium acid to neutral. The A horizon is 2 to 7 inches thick.

The E horizon is light yellowish brown, pink, very pale brown, light brown, or brown fine sandy loam. Reaction ranges from medium acid to neutral. The E horizon is 2 to 10 inches thick.

The Bt horizon is red, yellowish red, dark red, reddish brown, or reddish yellow. Mottles in shades of yellow, brown, or red range from few to many in the lower part of the Bt horizon. Mottles in shades of gray are in some pedons below a depth of 30 inches. Texture is clay, sandy clay, or clay loam. Reaction is medium acid or slightly acid in the upper part of the horizon and medium acid to neutral in the lower part.

The BC horizon is mottled in shades of red, yellow, and brown. The texture is sandy clay loam, clay loam, or sandy clay. Some pedons have fragments of weathered sandstone or shale. Reaction ranges from medium acid to moderately alkaline. Many pedons have films, threads, or soft masses of calcium carbonate.

The C horizon is shades of brown, gray, or yellow or is stratified with these colors. The texture is sandy clay loam, clay loam, fine sandy loam, or shaly clay stratified with loamy material or thin layers of weakly cemented sandstone. Commonly, it grades to weakly cemented packsand interbedded with loamy or clayey material. Reaction ranges from medium acid to moderately alkaline with calcareous spots or strata in some pedons.

Wise Series

The Wise series consists of moderately deep, loamy soils on erosional uplands. The soils formed in stratified loamy and shaly marine sediment (fig. 35). Slope ranges from 3 to 8 percent.

Typical pedon of Wise clay loam, 3 to 8 percent slopes; from Texas Highway 114 in Bridgeport, 7.8 miles south on Farm Road 2123, 3 miles west and southwest on a county road, and 0.6 mile south and 50 feet east of county road, in rangeland:

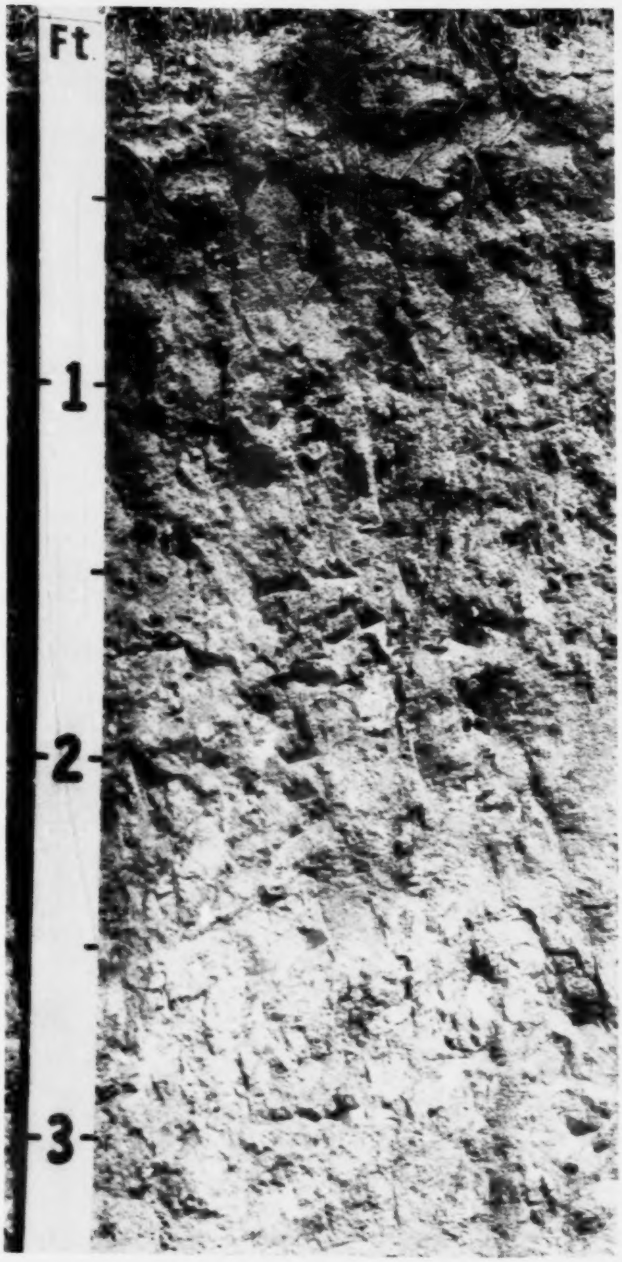

Figure 35.—Wise clay loam weathered from calcareous, silty and clayey shaly sediment, which is at a depth of 34 inches.

A—0 to 7 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 4/2) moist; moderate fine granular and subangular blocky structure; hard, very friable; many fine and medium and few coarse roots; common wormcasts; common fine and medium pores; few fine concretions of calcium carbonate; few fossil shells and limestone fragments less than 0.5 inch across; calcareous, moderately alkaline; gradual smooth boundary.

Bw—7 to 18 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate very fine and fine subangular blocky structure; hard, friable; common fine and few medium roots; few wormcasts; few fine pores; few fine and medium concretions of calcium carbonate; few fossil shells and limestone fragments less than 0.5 inch across; calcareous, moderately alkaline; diffuse smooth boundary.

Bk—18 to 27 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; few medium distinct light yellowish brown (2.5Y 6/4) and olive yellow (2.5Y 6/6) mottles; moderate fine and medium blocky structure; very hard, friable; few fine and medium roots; few wormcasts; few fine and medium pores; less than 3 percent, by volume, fine concretions, soft masses, films, and threads of calcium carbonate; calcareous, moderately alkaline; clear smooth boundary.

C—27 to 60 inches; stratified layers less than 1 inch to 14 inches thick of light gray (2.5Y 7/2) silt loam, light brownish gray (2.5Y 6/2) moist, and light gray (5Y 7/2) shaly silty clay loam, light olive gray (5Y 6/2) moist; common medium distinct pale yellow (2.5Y 7/4) mottles in shaly material; massive; very hard, friable; few fine roots; less than 2 percent, by volume, calcium carbonate concretions and soft masses less than 0.5 inch in diameter; few rounded limestone nodules 2 to 6 inches in diameter; calcareous, moderately alkaline.

The solum ranges from 20 to 40 inches in thickness. Texture is clay loam, silty clay loam, or loam in the control section. Silicate clay ranges from 20 to 30 percent. Particles coarser than very fine sand make up less than 15 percent. Reaction of the solum and C horizon is mildly alkaline or moderately alkaline and calcareous. The calcium carbonate equivalent of the control section ranges from 15 to 35 percent. Fossil shell and limestone fragments up to 3 inches across range from none to 10 percent, by volume, in some horizons.

The A horizon is brown, dark brown, dark grayish brown, or grayish brown. It is 5 to 9 inches thick. A surface layer having moist value of less than 3.5 is less than 7 inches thick.

The Bw and Bk horizons are grayish brown, light brownish gray, light gray, very pale brown, pale brown, brown, light yellowish brown, yellowish brown, or pale yellow. Some pedons have few to common mottles in shades of olive, brown, or yellow.

The C horizon is light brownish gray, light gray, very pale brown, pale brown, or white. Typically, this horizon has few to common mottles in shades of olive, brown, or yellow. Texture is dominantly loamy but is commonly stratified with shaly, sandy, and loamy soil material. Calcium carbonate concretions and soft masses range from a few to about 5 percent, by volume. Limestone nodules more than 3 inches in diameter range from none to less than 2 percent, by volume. Roots are throughout but are concentrated along cleavage planes and fractures. Some pedons have strata 0.5 inch to 4.0 inches thick of soft calcareous sandstone or weakly cemented to strongly cemented limestone. A sandy layer is below the sola or below a depth of 40 inches in some pedons. It is mainly very fine sand or loamy very fine sand.

Factors of Soil Formation

Soil is produced by the action of soil-forming processes on material deposited or accumulated by geologic forces. The characteristics of the soil at any given place are determined by the physical and mineral composition of the parent material, the effects of climate, the plant and animal life on and in the soil, the relief or lay of the land, and the length of time these forces have acted on the material. All five factors influence the present characteristics of every soil, but the significance of each factor varies from one place to another. One factor may dominate soil formation in one area; in another area a different factor may be important.

The interrelationships of these factors are complex, and the effects of any one factor cannot be isolated and completely evaluated; however, each factor does have certain probable effects.

Parent Material

Parent material is the unconsolidated mass from which a soil is formed. It determines the limits of the chemical and mineral composition of the soil. The soils of Wise County have developed from parent material that was deposited by or in water.

Most of the soils in Wise County formed from parent material deposited during the Pennsylvanian and Cretaceous geological periods. This parent material included hard crystalline limestone, softer limestone interbedded with chalk and marls, hard sandstone, soft and weakly consolidated sandstone, shaly clay, loamy and clayey sediment, and calcareous marl, clay, and shale. Palopinto and Hensley soils developed from hard crystalline limestone, and Bolar and Somervell soils developed from the softer limestone. Bonti, Darnell, and Exray soils developed from hard sandstone. Keeter and Weatherford soils formed from soft and weakly consolidated sandstone. Cona, Owens, and Truce soils formed from shaly clay, and Chaney, Selden, and Windthorst soils formed from loamy and clayey sediment. Medlin, Sanger, and Slidell soils formed from calcareous marl, clay, and shale.

Other soils formed from parent material deposited during the Quaternary geological period. The Quaternary period can be subdivided into Pleistocene and Recent ages. Parent material deposited during the Pleistocene age are on ancient stream terraces above present-day flood plains. This parent material includes sandy and loamy sediment from which Bastsil and Silawa soils developed. The Recent age parent material is on flood plains of streams. This parent material includes loamy sediment from which such soils as Pulexas and Balsora developed, and calcareous loamy and clayey sediment from which Frio and Trinity soils developed.

Climate

The climate contributes to the formation of soils in several ways. The high temperatures, periods of high humidity, and rainfall have helped water penetrate deeply into the earth's crust. The moisture and warm temperatures favor the development of micro-organisms, deep penetration of plant roots, and chemical weathering. As a result, many deep soils have formed. Leaching has removed calcium and other chemicals from some soils, making them low in certain kinds of essential plant nutrients.

Patterns of rainfall distribution cause the soils to be alternately wet and dry. When clay soils, such as Sanger and Slidell, become dry, they crack, and rainfall washes some of the surface layer into the cracks. If wetting continues, the cracks swell shut. This alternate shrinking and swelling of the soils causes churning and prevents the formation of clay accumulations. Other soils, such as Ponder, Truce, and Windthrost, have clayey lower layers. Water detaches clay particles from the surface layer as it moves through the soil. These particles are deposited in lower layers as water movement slows. As clay accumulates, the water moves even slower, the deposition of clay accelerates, and the lower layers become more clayey.

Wind also affects the formation of soils. The sandy and loamy soil material in which the Heaton, Patilo, and Nimrod soils formed has been reworked by wind.

Plant and Animal Life

Vegetation, animals, micro-organisms, earthworms, other organisms, and more recently, man, contribute to the development of soils. Living organisms cause gains in organic matter and nitrogen in soils, gains or losses in plant nutrients, and changes in structure and porosity.

In the nearly treeless prairies of Wise County, tall grasses had more influence on soil development than other plants. These grasses provided litter that protected the surface and added organic matter to dark soils, such as the Bolar, Purves, and Slidell soils. The grass roots reached deeply into the soil and utilized minerals at lower depths. Lime, other minerals, and organic matter were distributed throughout the soil as the plants died and decomposed. The decomposed plant roots left channels that increased intake of water and aeration of the soil. Earthworms and other soil organisms fed on the decomposed roots. The borings of earthworms also helped channel water and air through the soil.

In parts of the county where the native vegetation is mostly oak savannah, organic matter has mainly accumulated in the top few inches of the soil. This organic matter is quickly destroyed if the soil is cultivated. Soils, such as Chaney, Keeter, and Windthrost, have a light color surface layer and are acid in the upper part of the subsoil. Burrowing animals, such as worms, ants, gophers, and badgers, help mix soil and parent material.

Man and his methods of tillage and grazing animals have also influenced soil formation. Much of the savannahs and the prairies have been cleared for cropland. Cultivation has encouraged runoff and erosion, reducing the content of organic matter. Tillage and continuous grazing have compacted the clayey soils and reduced aeration, infiltration, and permeability. All these changes are reflected in current productivity, and they will have some affect on the rate and kinds of future development of the soils.

Relief

Relief affects soil formation by its influence on drainage, erosion, plant cover, and soil temperature.

The relief in Wise County ranges from nearly level to steep. On nearly level and gently sloping soils, such as Hassee, Ponder, and Slidell, most rainfall enters the soil, allowing deep development. Some steeper soils, such as Owens and Medlin, formed in similar parent material, but natural erosion or rapid runoff has kept the surface layer thin and light colored. The solum of these soils is not as thick as that of soils that formed on less sloping topography. Some soils, such as Balsora, Frio, Pulexas and Trinity, are affected by flooding that deposits sediment from the surrounding watersheds.

The sloping to moderately steep Aledo and Brackett soils that are on east- and north-facing slopes have a thicker and darker surface layer than those soils on south- and west-facing slopes. More organic matter accumulates where slopes are less exposed to sunlight and the soil temperature is lower.

Time

A long time is usually required for formation of soils that have distinct horizons. However, the effects of time are modified by the other four factors of soil development. The differences in length of time that parent materials have been in place are generally reflected in the degree of development of the soil profile.

The soils in Wise County range from young to old. The young soils have very little horizon development, and the older soils have well expressed soil horizons. Pulexas soils, which are young soils, show little development. The soil horizons still show the evidence of stratification, and there has been little change from the original stream-deposited alluvium. Older soils, such as Chaney and Selden, have well developed soil horizons. The parent material has been in place for a long time. A downward movement and accumulation of soil particles have resulted in a distinct Bt horizon.

Geology

Homer H. Logan, geologist, Soil Conservation Service, helped prepare this section.

Wise County soils developed from sediment of three major geologic periods: the 270 to 300 million year old Pennsylvanian system, the 110 to 130 million year old Cretaceous system, and the Quaternary system that ranges from the present to 3 million years old *(5)*.

Pennsylvanian sediment is exposed in the northwestern part of the county and along a part of the western county line *(10)*. Lake Bridgeport is almost totally on Pennsylvanian rock. A small exposure of sandstone in the northwestern part of the county is Permian age. Cretaceous rocks cover the remainder of Wise County with the exception of Quaternary alluvium in the flood plain areas of the Trinity River and its tributaries. The Pennsylvanian rock exposures are progressively younger from the east to the west and north. The Cretaceous and Quaternary systems are younger from the west to the east and south.

The Pennsylvanian formations dip to the northwest and are unconformably overlain by Cretaceous sedimentary rock that dips to the southeast *(4)*. This contact comprises an angular unconformity. An unconformity exists when a continuum in the geologic record is broken, that is, rocks from intervening geologic ages are missing. A break of this nature is generally attributed to ancient erosional processes.

Pennsylvanian Rock Units

The oldest Pennsylvanian formation exposed in Wise County is the Palo Pinto. The Willow Point Limestone, a single member of the Palo Pinto Formation, has been mapped along and in the vicinity of the southeastern shoreline of Lake Bridgeport. It is sandy and oolitic, hard, thin to thick bedded, and light olive gray, and it forms a distinct bench. The rest of the Palo Pinto Formation is composed of limestone, mudstone, claystone, and sandstone that are gray to pale yellowish orange. The formation is generally hard and fossiliferous. The Palo Pinto Formation is about 260 feet thick.

The Graford Formation crops out along the west, south, and middle eastern shores of Lake Bridgeport. It is dominantly shale and limestone, although some interbedded sandstone is also evident. Separately mapped members of this formation in Wise County include the Devils Den Limestone, Jasper Creek Shale, Rock Hill Limestone, Chico Ridge Limestone, and Lake Bridgeport Shale. These members are generally hard and tough and mostly thick bedded. As a result of the weathering processes, these members are in various shades of gray, green, and brown, occasionally mixed with some light tinges of yellow, orange, and red. The Graford Formation is about 450 feet thick.

The Brad Formation forms the northwestern shore of Lake Bridgeport and is made up of two members, the Ranger Limestone and the Placid Shale. Some fine- to coarse-grained sandstone of variable thickness also occurs in the Brad Formation. The Ranger Limestone is hard to soft, depending on the clay content, and is in various shades of gray to grayish yellow. The Placid Shale (mudstone and claystone) is tough to brittle and massive to thinly bedded. Ironstone concretions are common in the lower units. The Placid Shale is in various shades of gray to grayish orange. The Brad Formation ranges to 350 feet thick.

The Graham and Caddo Creek Formations are in northwestern Wise County and consist of yellowish brown limestone; gray, olive, and red mudstone and claystone; and some dusky yellow sandstone in the lower part of the Graham Formation. The combined thickness of the two formations ranges from 460 to 500 feet.

The Pennsylvanian system in Wise County is represented by loamy and stony soils of the Truce-Cona and the Palopinto-Hensley-Lindy general soil map units. The soils of the Truce-Cona general soil map unit formed in members of those formations that are composed of mudstone, claystone, sandstone, and shale. The soils of the Palopinto-Hensley-Lindy general soil map unit formed in members of those formations that are limestone.

Permian Rock Units

Some question that a small exposure of sandstone in the northwestern part of the county is Permian in age. This rock unit is 10 to 20 feet thick. Its color is shades of olive, brown, orange, and red. This rock unit is prominently exposed in adjacent counties to the north and west. Soils of the Truce-Cona general soil map unit formed in this sandstone.

Cretaceous Rock Units

The Twin Mountains Formation is on the surface in the southwest quarter of Wise County. This formation is the oldest Cretaceous deposit in the survey area. It is composed of fine grained to coarse grained sand, clay, and conglomerate. This formation is thinly bedded to massive. It is brownish yellow and weathers to red. The Twin Mountains Formation is from 175 feet to 200 feet thick. Loamy and sandy soils of the Windthorst-Chaney-Selden general soil map unit formed in this formation.

The Glen Rose Formation overlies the Twin Mountains Formation. This formation is about 40 feet thick in southwestern Wise County and diminishes in thickness to the northeast, losing its definition about 2.5 miles west of Decatur. The Glen Rose Formation is brownish yellow to gray, thin bedded limestone, clay, and sand. Most of the Wise soils have developed from this formation.

The Paluxy Formation overlies the Glen Rose Formation and extends from Decatur south to the county line and then west to the southwest corner of the county. This formation is a silty, fine grained to very fine grained, light brownish yellow to light gray sand. The Paluxy Formation ranges to 225 feet thick. The loamy soils of the Duffau-Keeter-Weatherford general soil map unit formed in this formation.

The Antlers Formation covers about a fourth of the surface area of Wise County and extends from the central part of the county northward into Montague County. It is the same material as the Twin Mountains and Paluxy Formations and is an extension of these two formations. Soils of the Windthorst-Chaney-Selden and the Duffau-Keeter-Weatherford general soil map units are dominant.

The Goodland Limestone and Walnut Clay were mapped as a single geologic unit. These formations are exposed on the surface of eastern Wise County from the north county line to the south county line. They are 13 to 20 feet thick and are fine grained, hard limestone, grading downward to a dark gray, marly shale. Soils of the Venus-Aledo-Somervell and the Sanger-Purves-Somervell general soil map units formed in these formations.

The Kiamichi Formation overlies a part of the Goodland Limestone and Walnut Clay in eastern Wise County. This formation is 20 to 50 feet thick. It is mostly marl that has interbedded limestone and sandstone. The Kiamichi Formation is fossiliferous and is yellowish gray to medium gray. Loamy and gravelly soils of the Venus-Aledo-Somervell general soil map unit formed in this formation.

The youngest Cretaceous rock unit exposed in the county is the Fort Worth Limestone/Duck Creek Formation. These formations are the dominant exposure in the extreme northeastern and southeastern corners of Wise County. The Fort Worth Limestone/Duck Creek Formation is about 135 feet thick. The upper 10 feet of the formation is mostly limestone. The remainder is gray, thin interbedded limestone and marly clay. Soils of the Sanger-Purves-Somervell general soil map unit formed in these formations.

Quaternary Rock Units

The Quaternary rock units in Wise County consist of loamy, sandy, and gravelly terrace deposits. The terraces of Pleistocene age developed into sandy and loamy soils of the Bastsil-Silawa general soil map unit.

Other Quaternary deposits include the Recent age deposits of loamy and clayey alluvium that have accumulated on the flood plains of the West Fork of the Trinity River, Denton Creek, and their tributaries. The alluvial soils of the Pulexas-Balsora-Deleon and the Frio-Trinity general soil map units formed in these deposits.

References

(1) American Association of State Highway and Transportation Officials. 1982. Standard specifications for highway materials and methods of sampling and testing. Ed. 13, 2 vol., illus.

(2) American Society for Testing and Materials. 1986. Standard test method for classification of soils for engineering purposes. ASTM Stand. D 2487.

(3) Cates, Cliff D. 1907. Pioneer history of Wise County, Decatur. 471 pp., illus. (Issued September 1932).

(4) Scott, Gayle and J.M. Armstrong. 1932. The geology of Wise County, Texas. Univ. Tex., Austin, Bull. 3224, 77 pp.

(5) Sellards, E.H., W.S. Adkins, and F.B. Plummer. 1932. The geology of Texas, vol. 1, stratigraphy. Univ. Tex., Austin, Bull. 3232; 1,007 pp.

(6) Texas Natural Resources Information System. 1984. Computer based mapping system; Wise County, Texas, data.

(7) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. (Supplements replacing pp. 173-188 issued May 1962).

(8) United States Department of Agriculture. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210, 21 pp.

(9) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

(10) University of Texas Bureau of Economic Geology. 1967. Geologic atlas of Texas, Sherman Sheet.

Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). The volume of soft soil decreases excessively under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazingland for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, such as fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay are in the soil. The soil is not a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil restrict the growth of some plants.

Fast intake (in tables). The movement of water into the soil is rapid.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant that is not a grass or a sedge.

Gilgai. Commonly a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of Vertisols--clayey soils having a high coefficient of expansion and contraction with changes in moisture content.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is, in part, a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as accumulation of clay, sesquioxides, humus, or a combination of these; prismatic or blocky structure; redder or browner colors than those in the A horizon; or a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Arabic numeral 2 precedes the letter C.

R layer.—Consolidated rock (unweathered bedrock) beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the plants that are the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material. This contrasts with percolation, which is movement of water through soil layers or material.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Large stones (in tables). Rock fragments that are 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Subsurface tunnels or pipelike cavities are formed by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of the acidity or alkalinity of a soil expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rippable. Rippable bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). There is a shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slippage (in tables). The soil mass is susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed on the contour or at a slight angle to the contour across sloping soils. The terrace intercepts surface runoff, so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Well graded. Refers to soil material consisting of course grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. This contrasts with poorly graded soil.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Data recorded in the period 1951-80 at Bridgeport, Texas]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have--		Average number of growing degree days*	Average	2 years in 10 will have--		Average number of days with 0.10 inch or more	Average snowfall
				Maximum temperature higher than--	Minimum temperature lower than--			Less than--	More than--		
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	54.9	28.8	41.9	84	7	47	1.56	.23	2.57	3	1.8
February---	59.5	32.9	46.2	87	11	79	1.56	.57	2.37	4	1.6
March------	67.6	40.3	54.0	91	19	210	2.17	.63	3.41	4	.1
April------	77.4	51.0	64.2	96	31	426	3.17	1.26	4.76	5	.0
May--------	84.5	59.2	71.9	100	41	679	4.26	2.08	6.14	6	.0
June-------	93.7	67.4	80.6	106	53	918	2.68	.80	4.19	4	.0
July-------	99.5	70.9	85.2	111	59	1,091	2.10	.56	3.33	4	.0
August-----	99.1	69.2	84.2	110	58	1,060	1.87	.54	2.94	4	.0
September--	90.7	62.5	76.6	106	45	798	3.31	1.20	5.08	5	.0
October----	80.1	50.9	65.5	99	32	481	2.86	.58	4.62	4	.0
November---	66.4	39.7	53.1	88	20	162	1.87	.49	2.97	3	.4
December---	58.7	32.1	45.4	83	12	35	1.45	.41	2.29	3	.3
Yearly:											
Average--	77.7	50.4	64.1	---	---	---	---	---	---	---	---
Extreme--	---	---	---	112	6	---	---	---	---	---	---
Total----	---	---	---	---	---	5,986	28.86	21.90	35.35	49	4.2

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 °F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Data recorded in the period 1951-80 at Bridgeport, Texas]

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	March 19	April 2	April 11
2 years in 10 later than--	March 11	March 28	April 6
5 years in 10 later than--	February 24	March 18	March 26
First freezing temperature in fall:			
1 year in 10 earlier than--	November 7	November 1	October 25
2 years in 10 earlier than--	November 17	November 6	October 30
5 years in 10 earlier than--	December 5	November 22	November 9

TABLE 3.--GROWING SEASON

[Data recorded in the period 1951-80 at Bridgeport, Texas]

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	251	228	205
8 years in 10	262	231	212
5 years in 10	264	248	227
2 years in 10	306	265	242
1 year in 10	317	274	249

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AnC	Anocon loam, 2 to 5 percent slopes	4,100	0.7
Ar	Arents, loamy	1,000	0.2
Ba	Balsora silt loam, occasionally flooded	4,900	0.8
Bb	Balsora silt loam, frequently flooded	8,400	1.4
Bc	Balsora silty clay, frequently flooded	1,500	0.3
BdB	Bastsil loamy fine sand, 0 to 3 percent slopes	6,300	1.1
BfB	Bastsil fine sandy loam, 0 to 3 percent slopes	15,400	2.6
BkB	Blanket clay loam, 1 to 3 percent slopes	1,800	0.3
BoB	Bolar clay loam, 1 to 3 percent slopes	3,800	0.6
BoC	Bolar clay loam, 3 to 5 percent slopes	3,100	0.5
BtC	Bonti fine sandy loam, 2 to 5 percent slopes	1,400	0.2
BxC	Bonti-Exray complex, stony, 1 to 8 percent slopes	3,000	0.5
ByE	Brackett-Aledo complex, 5 to 20 percent slopes	18,200	3.1
ChB	Chaney loamy fine sand, 1 to 4 percent slopes	25,100	4.2
CoB	Cisco loamy sand, 1 to 3 percent slopes	3,500	0.6
CsE	Cona very stony sandy loam, 3 to 12 percent slopes	18,100	3.1
DaE	Darnell-Exray complex, very stony, 5 to 20 percent slopes	4,200	0.7
De	Deleon silty clay, frequently flooded	3,500	0.6
DfC	Duffau loamy fine sand, 1 to 5 percent slopes	6,700	1.1
DuB	Duffau fine sandy loam, 1 to 3 percent slopes	20,200	3.4
DvC4	Duffau-Gullied land complex, 3 to 8 percent slopes	11,600	2.0
Fr	Frio silty clay loam, occasionally flooded	10,800	1.8
HaB	Hassee fine sandy loam, 0 to 2 percent slopes	8,500	1.4
HeB	Hensley very stony loam, 1 to 3 percent slopes	3,300	0.6
KtC	Keeter very fine sandy loam, 1 to 6 percent slopes	27,300	4.6
KtC3	Keeter very fine sandy loam, 2 to 6 percent slopes, eroded	21,700	3.7
LnB	Lindy loam, 1 to 3 percent slopes	1,800	0.3
MaB	May fine sandy loam, 0 to 2 percent slopes	800	0.1
MdE	Medlin-Sanger stony clays, 5 to 15 percent slopes	6,900	1.2
MoB	Mingo silty clay loam, 1 to 3 percent slopes	400	0.1
NdB	Nimrod fine sand, 1 to 4 percent slopes	4,600	0.8
OwE	Owens very stony clay, 8 to 30 percent slopes	3,800	0.6
PaC	Palopinto extremely stony silty clay loam, 1 to 8 percent slopes	4,000	0.7
PhC	Patilo-Heaton fine sands, 3 to 12 percent slopes	3,400	0.6
Po	Pits, quarries	3,000	0.5
PrB	Ponder clay loam, 1 to 3 percent slopes	2,200	0.4
Ps	Pulexas very fine sandy loam, occasionally flooded	19,400	3.3
Pu	Pulexas soils, frequently flooded	17,200	2.9
PvB	Purves clay, 1 to 3 percent slopes	12,600	2.1
SaB	Sanger clay, 1 to 3 percent slopes	14,200	2.4
SaC	Sanger clay, 3 to 5 percent slopes	14,700	2.5
SaD	Sanger clay, 5 to 8 percent slopes	4,100	0.7
SbB	San Saba clay, 1 to 3 percent slopes	3,800	0.6
SdB	Selden loamy fine sand, 1 to 3 percent slopes	17,300	2.9
SeE	Set very stony silty clay, 8 to 30 percent slopes	1,700	0.3
SfC	Silawa fine sandy loam, 3 to 8 percent slopes	7,700	1.3
SfC3	Silawa fine sandy loam, 3 to 8 percent slopes, eroded	2,800	0.5
SgA	Slidell clay, 0 to 1 percent slopes	600	0.1
SgB	Slidell clay, 1 to 3 percent slopes	6,900	1.2
SoC	Somervell-Aledo complex, 1 to 8 percent slopes	35,500	6.0
SpB	Speck clay loam, 0 to 2 percent slopes	1,400	0.2
ThB	Thurber clay loam, 1 to 3 percent slopes	2,000	0.3
Tr	Trinity clay, occasionally flooded	3,200	0.5
TuB	Truce fine sandy loam, 1 to 3 percent slopes	5,800	1.0
TuC	Truce fine sandy loam, 3 to 5 percent slopes	5,800	1.0
TuC3	Truce fine sandy loam, 2 to 5 percent slopes, eroded	2,300	0.4
VeB	Venus loam, 1 to 3 percent slopes	1,200	0.2
VeC	Venus loam, 3 to 8 percent slopes	20,700	3.5
VrC	Vernon clay, 3 to 8 percent slopes	3,500	0.6
WeC	Weatherford-Duffau complex, 3 to 8 percent slopes	41,800	7.2
WeC3	Weatherford-Duffau complex, 3 to 8 percent slopes, eroded	21,400	3.6
Wf	Westfork silty clay, occasionally flooded	700	0.1
WtC	Windthorst fine sandy loam, 1 to 5 percent slopes	22,000	3.7
WtC3	Windthorst fine sandy loam, 2 to 6 percent slopes, eroded	11,000	1.9
WzC	Wise clay loam, 3 to 8 percent slopes	9,400	1.6

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
	Water (areas more than 40 acres in size)	10,863	1.8
	Water (areas 5 to 40 acres in size)	1,100	0.2
	Total	590,963	100.0

TABLE 5.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Map symbol and soil name	Land capability	Wheat	Grain sorghum	Peanuts	Improved bermudagrass	Hay crops, annuals
		Bu	Bu	Lbs	AUM*	Tons
AnC---------------------- Anocon	IIIe	25	35	---	6.0	2.1
Ar**--------------------- Arents	IVe	---	---	---	6.5	2.8
Ba----------------------- Balsora	IIw	35	70	---	8.0	5.6
Bb, Bc------------------- Balsora	Vw	---	---	---	8.0	4.8
BdB---------------------- Bastsil	IIIe	35	50	1,200	6.5	3.2
BfB---------------------- Bastsil	IIe	40	65	1,200	7.0	4.5
BkB---------------------- Blanket	IIe	35	60	---	6.0	3.6
BoB---------------------- Bolar	IIe	40	45	---	6.0	2.7
BoC---------------------- Bolar	IIIe	35	40	---	5.5	2.2
BtC---------------------- Bonti	IIIe	---	35	---	3.5	1.6
BxC---------------------- Bonti-Exray	VIs	---	---	---	---	---
ByE---------------------- Brackett-Aledo	VIIs	---	---	---	---	---
ChB---------------------- Chaney	IIIe	20	35	1,200	6.0	2.7
CoB---------------------- Cisco	IIIe	---	40	1,400	6.0	2.4
CsE---------------------- Cona	VIs	---	---	---	---	---
DaE---------------------- Darnell-Exray	VIIs	---	---	---	---	---
De----------------------- Deleon	Vw	---	---	---	6.5	3.9
DfC---------------------- Duffau	IIIe	---	40	1,400	6.5	2.6
DuB---------------------- Duffau	IIe	35	45	1,400	6.5	2.9

See footnotes at end of table.

TABLE 5.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Wheat	Grain sorghum	Peanuts	Improved bermudagrass	Hay crops, annuals
		Bu	Bu	Lbs	AUM*	Tons
DvC4 Duffau-Gullied land	VIe	---	---	---	---	---
Fr Frio	IIw	45	75	---	7.0	5.6
HaB Hassee	IIIw	20	35	900	4.5	2.4
HeB Hensley	VIs	---	---	---	---	---
KtC Keeter	IVe	---	---	1,000	4.0	2.0
KtC3 Keeter	IVe	---	---	---	3.5	---
LnB Lindy	IIIe	25	---	---	5.0	2.2
MaB May	IIe	35	50	1,200	6.5	3.2
MdE Medlin-Sanger	VIs	---	---	---	---	---
MoB Mingo	IIIe	30	40	---	5.0	2.5
NdB Nimrod	IIIe	---	40	1,200	6.0	2.4
OwE Owens	VIIs	---	---	---	---	---
PaC Palopinto	VIs	---	---	---	---	---
PhC Patilo-Heaton	IVe	---	---	---	4.5	---
Po. Pits						
PrB Ponder	IIIe	35	55	---	6.0	3.3
Ps Pulexas	IIw	30	70	1,200	7.5	5.2
Pu Pulexas	Vw	---	---	---	7.5	---
PvB Purves	IIIe	25	35	---	4.0	1.8
SaB Sanger	IIe	40	70	---	6.5	4.5

See footnotes at end of table.

TABLE 5.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Wheat	Grain sorghum	Peanuts	Improved bermudagrass	Hay crops, annuals
		Bu	Bu	Lbs	AUM*	Tons
SaC---------------------- Sanger	IIIe	35	65	---	6.0	4.0
SaD---------------------- Sanger	IVe	30	---	---	6.0	3.6
SbB---------------------- San Saba	IIIe	35	65	---	6.0	3.9
SdB---------------------- Selden	IIIe	20	40	1,200	7.5	3.0
SeE---------------------- Set	VIIs	---	---	---	---	---
SfC---------------------- Silawa	IVe	---	40	---	5.5	2.2
SfC3--------------------- Silawa	IVe	---	---	---	5.0	1.7
SgA---------------------- Slidell	IIw	40	80	---	7.0	5.6
SgB---------------------- Slidell	IIe	40	70	---	7.0	4.9
SoC---------------------- Somervell-Aledo	VIs	---	---	---	---	---
SpB---------------------- Speck	IIIe	15	---	---	---	1.8
ThB---------------------- Thurber	IIIe	20	30	---	3.5	2.0
Tr----------------------- Trinity	IIw	40	90	---	8.0	7.2
TuB---------------------- Truce	IIe	20	35	---	4.0	2.0
TuC---------------------- Truce	IIIe	---	30	---	4.0	1.8
TuC3--------------------- Truce	IIIe	---	---	---	3.0	---
VeB---------------------- Venus	IIe	35	70	---	7.0	4.9
VeC---------------------- Venus	IVe	---	---	---	6.0	3.5
VrC---------------------- Vernon	VIe	---	---	---	---	---
WeC---------------------- Weatherford-Duffau	IVe	---	---	1,000	6.0	2.3

See footnotes at end of table.

TABLE 5.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Wheat	Grain sorghum	Peanuts	Improved bermudagrass	Hay crops, annuals
		Bu	Bu	Lbs	AUM*	Tons
WeC3---------------------- Weatherford-Duffau	IVe	---	---	800	5.5	1.7
Wf------------------------ Westfork	IIIw	15	25	---	3.0	1.8
WtC----------------------- Windthorst	IIIe	20	35	1,000	5.0	2.0
WtC3---------------------- Windthorst	VIe	---	---	---	---	---
WzC----------------------- Wise	IVe	---	---	---	4.0	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** Smoothed and reclaimed areas.

TABLE 6.--RANGELAND PRODUCTIVITY

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Map symbol and soil name	Range site	Potential annual production for kind of growing season		
		Favorable Lb/acre	Average Lb/acre	Unfavorable Lb/acre
AnC Anocon	Loamy Prairie	7,000	5,000	3,500
Ar Arents	Sandy Loam	5,500	4,500	2,500
Ba, Bb, Bc Balsora	Loamy Bottomland	7,500	6,200	5,000
BdB Bastsil	Loamy Sand	6,000	4,000	2,500
BfB Bastsil	Sandy Loam	6,200	5,000	3,300
BkB Blanket	Clay Loam	6,500	5,000	3,000
BoB, BoC Bolar	Clay Loam	6,500	5,000	3,000
BtC Bonti	Sandy Loam	6,000	4,000	3,000
BxC:				
Bonti	Sandy Loam	5,000	4,000	3,000
Exray	Sandy Loam	5,000	4,000	2,500
ByE:				
Brackett	Steep Adobe	3,000	2,200	1,500
Aledo	Shallow	2,650	1,800	1,500
ChB Chaney	Loamy Sand	4,500	4,000	3,000
CoB Cisco	Loamy Sand	4,500	4,000	3,000
CsE Cona	Sandstone Hill	4,000	3,000	2,000
DaE:				
Darnell	Sandstone Hill	3,200	2,250	1,500
Exray	Sandstone Hill	4,000	3,000	2,000
De Deleon	Clayey Bottomland	7,500	6,000	4,000
DfC Duffau	Loamy Sand	4,500	4,000	3,000
DuB Duffau	Sandy Loam	5,500	4,500	3,000

TABLE 6.--RANGELAND PRODUCTIVITY--Continued

Map symbol and soil name	Range site	Potential annual production for kind of growing season		
		Favorable Lb/acre	Average Lb/acre	Unfavorable Lb/acre
DvC4:				
Duffau	Sandy Loam	5,000	3,750	2,500
Gullied land.				
Fr Frio	Loamy Bottomland	7,500	5,000	4,500
HaB Hassee	Claypan Prairie	4,000	3,000	2,000
HeB Hensley	Redland	4,700	3,750	2,500
KtC Keeter	Tight Sandy Loam	4,500	3,500	2,000
KtC3 Keeter	Tight Sandy Loam	3,000	2,500	1,750
LnB Lindy	Deep Redland	6,500	5,000	4,000
MaB May	Sandy Loam	6,000	5,000	3,500
MdE:				
Medlin	Blackland	6,000	5,000	3,000
Sanger	Blackland	6,000	5,000	3,000
MoB Mingo	Deep Redland	5,500	4,500	3,500
NdB Nimrod	Sandy	4,500	3,500	2,000
OwE Owens	Rocky Hill	1,700	1,200	900
PaC Palopinto	Low Stony Hill	3,500	3,000	1,000
PtC:				
Patilo	Deep Sand	3,000	2,000	1,000
Heaton	Sandy	4,500	3,500	2,000
PrB Ponder	Clay Loam	5,500	4,000	2,000
Ps, Pu Pulexas	Loamy Bottomland	6,500	5,000	3,750
PvB Purves	Shallow	3,350	2,500	2,000
SaB, SaC, SaD Sanger	Blackland	6,500	5,000	3,000

TABLE 6.--RANGELAND PRODUCTIVITY--Continued

Map symbol and soil name	Range site	Potential annual production for kind of growing season		
		Favorable Lb/acre	Average Lb/acre	Unfavorable Lb/acre
SbB San Saba	Blackland	6,000	5,000	3,500
SdB Selden	Loamy Sand	5,000	4,200	3,500
SeE Set	Clay Loam Slope	5,000	3,500	2,500
SfC, SfC3 Silawa	Sandy Loam	5,500	4,500	2,500
SgA, SgB Slidell	Blackland	6,500	5,000	3,000
SoC: Somervell	Clay Loam	4,900	3,750	2,250
Aledo	Shallow	3,000	2,000	1,800
SpB Speck	Redland	3,800	3,000	2,000
ThB Thurber	Claypan Prairie	3,500	3,000	2,000
Tr Trinity	Clayey Bottomland	7,500	6,000	4,000
TuB, TuC Truce	Tight Sandy Loam	4,000	3,000	2,000
TuC3 Truce	Tight Sandy Loam	3,000	2,250	1,750
VeB, VeC Venus	Clay Loam	6,500	5,000	3,000
VrC Vernon	Shallow Clay	3,000	2,000	1,000
WeC: Weatherford	Sandy Loam	5,500	4,500	3,000
Duffau	Sandy Loam	5,500	4,500	3,000
WeC3: Weatherford	Sandy Loam	5,500	4,500	3,000
Duffau	Sandy Loam	5,500	4,500	3,000
Wf Westfork	Clayey Bottomland	5,650	4,500	3,000
WtC Windthorst	Tight Sandy Loam	5,000	3,750	2,250
WtC3 Windthorst	Tight Sandy Loam	3,000	2,300	1,750
WzC Wise	Clay Loam	6,000	4,500	3,000

TABLE 7.--PLANT SPECIES COMMON TO EACH RANGE SITE

[All plants in a range site having the same percentage number and letter are grouped to total a percentage of the composition. Example: Blackland range site--All forbs having 10a, when summed, represent 10 percent of the plant composition; all grasses having 15b represent 15 percent; big bluestem and indiangrass (45a) represent 45 percent; little bluestem is 25 percent; and switchgrass is 5 percent. Therefore, 10 percent + 15 percent + 45 percent + 25 percent + 5 percent = 100 percent of the plant composition of the Blackland range site. T = Trace]

Plant species	Range sites																			
	Blackland 1/	Clay Loam 1/	Clay Loam Slope 3/	Clayey Bottomland 1/ 2/ 3/	Claypan Prairie 3/	Deep Redland 1/ 3/	Deep Sand 2/	Loamy Bottomland 1/ 2/	Loamy Prairie 3/	Loamy Sand 2/	Low Stony Hill 3/	Redland 1/ 3/	Rocky Hill 3/	Sandstone Hill 3/	Sandy 2/	Sandy Loam 2/ 3/	Shallow 1/	Shallow Clay 3/	Steep Adobe 1/	Tight Sandy Loam 2/ 3/
FORBS																				
Basket flower	T	T	T	---	---	---	---	---	T	---	---	---	---	---	---	---	---	---	---	---
Blacksamson	10a	10a	---	---	---	5a	---	---	---	---	5a	T	---	---	---	---	5a	---	---	---
Bluebonnet	T	T	T	---	---	T	---	---	---	---	T	T	---	---	---	---	T	---	---	---
Buckwheat	T	T	T	---	---	T	---	---	---	5a	T	T	5a	---	---	---	5a	---	---	---
Bullnettle	---	---	---	---	---	---	5a	---	---	T	---	---	---	---	T	T	---	---	---	---
Bundleflower	10a	10a	5a	---	5a	5a	5a	---	5a	T	5a	---	5a	---	---	5a	5a	5a	---	---
Bushsunflower	---	---	---	---	5a	5a	---	---	---	---	5a	T	---	---	---	---	---	---	---	---
Compassplant	T	T	T	T	---	---	---	---	---	---	---	---	---	---	---	---	5a	---	T	---
coneflower	T	T	T	---	---	---	---	---	---	---	T	---	---	---	---	---	---	---	---	---
Croton	T	T	T	---	---	T	---	---	---	T	T	T	---	---	T	T	---	5a	---	---
Dalea	T	10a	T	5a	---	5a	---	5a	---	5a	5a	10a	5a	---	---	---	5a	5a	5a	---
Dayflower	T	T	T	---	---	---	5a	---	---	5a	---	---	---	---	T	5a	---	---	---	T
Engelmann-daisy	10a	10a	5a	---	5a	5a	---	5a	5a	5a	5a	10a	---	---	5a	5a	5a	5a	---	---
Eveningprimrose	T	T	T	T	---	---	5a	T	---	5a	---	---	---	---	T	T	---	---	---	T
Falsegaura	T	T	---	---	---	---	---	---	---	---	---	---	---	---	---	---	5a	---	---	---
Gaura	10a	10a	5a	5a	---	5a	---	5a	5a	5a	---	10a	---	---	---	5a	5a	5a	---	---
Gayfeather	10a	10a	5a	5a	5b	5a	---	T	5b	T	5a	10a	---	---	---	---	5a	5a	5a	---
Gray goldaster	---	---	T	---	---	---	---	---	---	---	---	---	5a	---	---	---	T	---	---	---
Halfshrub sundrop	10a	10a	5a	---	---	5a	---	---	---	5a	5a	T	---	---	---	---	5a	T	---	---
Heath aster	10a	10a	5a	---	5a	5a	---	5a	5a	---	---	T	5a	---	---	---	5a	---	---	10a
Ironweed	T	T	---	T	---	---	---	5a	T	---	---	---	---	---	---	---	---	---	---	---
Lespedeza	10a	10a	T	5a	---	---	5a	5a	---	---	---	---	---	5a	5a	5a	5a	---	---	10a
Maximilian sunflower	10a	10a	5a	5a	5a	5a	---	5a	T	5a	5a	T	---	---	5a	5a	5a	---	---	---
Milkweed	---	T	---	---	---	---	---	---	---	---	---	---	---	---	---	---	5a	---	---	---
Milkwort	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	5a	---
Penstemon	10a	10a	T	---	---	---	---	T	---	---	5a	---	---	---	---	---	5a	---	---	---
Prairie bluets	---	T	T	---	---	---	---	---	---	---	---	---	---	---	---	---	5a	---	---	---

See footnotes at end of table.

TABLE 7.--PLANT SPECIES COMMON TO EACH RANGE SITE--Continued

Plant species	Range sites																			
	Blackland 1/	Clay Loam 1/	Clay Loam Slope 3/	Clayey Bottomland 1/ 2/ 3/	Claypan Prairie 3/	Deep Redland 1/ 3/	Deep Sand 2/	Loamy Bottomland 1/ 2/	Loamy Prairie 3/	Loamy Sand 2/	Low Stony Hill 3/	Redland 1/ 3/	Rocky Hill 3/	Sandstone Hill 3/	Sandy 2/	Sandy Loam 2/ 3/	Shallow 1/	Shallow Clay 3/	Steep Adobe 1/	Tight Sandy Loam 2/ 3/
Prairie-clover--------	10a	10a	5a	---	---	5a	---	---	5a	---	5a	10a	---	---	---	---	5a	5a	5a	---
Prairie senna---------	10a	T	T	---	---	---	5a	---	5b	5a	---	T	---	---	T	---	---	5a	---	---
Queensdelight---------	---	T	---	---	---	---	---	---	---	---	---	---	---	---	---	---	5a	---	5a	---
Ruellia---------------	---	---	---	---	---	5a	---	---	---	---	---	T	---	---	---	---	---	---	---	---
Sage------------------	10a	T	T	---	---	5a	---	---	---	---	---	T	---	---	---	---	5a	---	---	---
Sagewort--------------	---	---	T	---	5b	T	---	---	5b	5a	---	T	5a	---	---	---	---	5a	---	10a
Sandlily--------------	---	---	---	---	---	---	5a	---	---	---	---	---	---	---	---	---	---	---	---	---
Scurfpea--------------	10a	10a	T	---	---	5a	---	---	---	---	5a	T	---	---	---	5a	5a	---	---	---
Sensitivebrier--------	10a	10a	5a	---	5a	5a	---	5a	5b	5a	5a	10a	---	5a	5a	5a	5a	5a	---	10a
Sida------------------	T	T	T	---	---	T	---	---	---	---	---	T	---	---	---	---	T	---	---	---
Skullcap--------------	---	T	---	---	---	---	---	---	---	---	---	---	---	---	---	---	5a	---	5a	---
Snakecotton-----------	---	---	---	---	---	---	5a	---	---	---	---	---	---	---	T	---	---	---	---	---
Snoutbean-------------	10a	T	---	5a	---	5a	---	5a	---	---	T	T	---	5a	5a	5a	5a	---	---	---
Snow-on-the-mountain	T	T	---	---	---	---	---	---	---	---	T	---	---	---	---	T	T	---	5a	---
Stemless actinea------	---	T	---	---	T	---	---	---	---	---	---	---	---	---	---	---	T	---	---	---
Tickclover------------	---	10a	---	5a	---	5a	5a	5a	---	---	---	---	---	5a	5a	5a	---	---	---	10a
Trailing ratany-------	T	10a	5a	---	5b	5a	---	---	5b	---	T	---	5a	---	---	---	5a	---	5a	10a
Verbena---------------	T	T	T	---	5b	---	---	---	---	T	---	---	---	---	---	T	T	---	---	---
Vetch-----------------	10a	10a	T	---	---	5a	---	---	---	---	---	T	---	---	---	---	---	---	---	---
Western ragweed-------	T	T	T	---	5b	5a	---	---	T	5a	5a	T	5a	---	T	5a	T	5a	---	10a
Western indigo--------	10a	T	T	---	---	5a	---	---	---	---	5a	T	---	---	---	5a	T	---	---	---
Wild alfalfa----------	T	T	T	---	---	---	---	---	5b	5a	---	---	---	---	---	---	5a	---	5a	---
Wildbean--------------	10a	10a	5a	5a	---	5a	5a	5a	---	5a	---	10a	---	5a	5a	5a	5a	---	---	10a
Winecup---------------	T	T	T	T	---	T	---	T	---	---	---	T	---	---	---	---	5a	---	---	---
Yellow neptunia-------	10a	10a	5a	---	5b	---	---	---	5b	5a	5a	10a	---	5a	5a	5a	5a	5a	---	10a
GRASSES & GRASS-LIKES																				
Arizona cottontop-----	---	---	5c	T	10a	---	---	---	---	---	---	---	5	T	---	---	---	15b	---	10
Bluestem, big---------	45a	20	15a	30b	---	55a	20a	30b	35a	15a	15a	5a	5c	5b	10b	15b	10a	---	5b	---
Bluestem, cane--------	15b	5c	15b	15c	15b	15b	---	T	5b	5b	15b	10b	15a	5c	---	5c	5b	15a	T	T
Bluestem, little------	25	35	25	30b	---	55a	5	20	25	30	25	35	5c	35	35	40	45	---	30	5
Bluestem, sand--------	---	---	---	---	---	---	20a	---	---	15a	---	---	---	---	10b	15b	---	---	---	---
Bluestem, silver------	15b	5c	15b	15c	15b	15b	---	T	5b	5b	15b	10b	15a	5c	5c	5c	5b	15a	5	5
Buffalograss----------	---	T	15b	15c	15b	5e	---	T	5b	---	20d	5c	10	---	---	---	5b	10	---	10a

See footnotes at end of table.

TABLE 7.--PLANT SPECIES COMMON TO EACH RANGE SITE--Continued

Plant species	Range sites																			
	Blackland 1/	Clay Loam 1/	Clay Loam Slope 3/	Clayey Bottomland 1/ 2/ 3/	Claypan Prairie 3/	Deep Redland 1/ 3/	Deep Sand 2/	Loamy Bottomland 1/ 2/	Loamy Prairie 3/	Loamy Sand 2/	Low Stony Hill 3/	Redland 1/ 3/	Rocky Hill 3/	Sandstone Hill 3/	Sandy 2/	Sandy Loam 2/ 3/	Shallow 1/	Shallow Clay 3/	Steep Adobe 1/	Tight Sandy Loam 2/ 3/
Carolina jointtail---	15b	5c	---	---	T	---	---	---	5b	---	---	---	---	---	---	5c	---	---	---	5b
Curlymesquite--------	---	---	---	---	---	---	---	---	---	---	20d	T	5	---	---	---	---	15b	---	---
Dropseed, hairy------	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	5a	---
Dropseed, meadow-----	15b	5c	15b	---	15c	15b	---	5c	5	---	15b	---	---	---	---	5c	5b	15b	5b	---
Dropseed, sand-------	---	---	---	---	15c	---	5	---	---	5c	---	---	---	---	5c	---	---	---	---	---
Dropseed, tall-------	15b	5c	15b	15c	15b	15b	---	5c	5b	5c	15b	10b	5	5b	5c	5c	10	15b	5a	---
Eastern gamagrass----	15b	---	---	30b	---	---	---	5c	---	---	---	---	---	---	---	T	---	---	---	---
Fall witchgrass------	T	---	---	---	---	5e	---	---	---	---	20d	T	---	---	---	---	---	---	---	---
Grama, blue----------	---	---	5c	5d	10	---	---	---	5	---	---	10b	5b	---	---	---	---	5c	---	5b
Grama, hairy---------	---	5c	5c	---	15c	---	---	---	---	---	20d	5c	5b	5c	---	---	5b	5c	5	5b
Grama, sideoats------	15b	10b	20	30b	40	15b	---	5c	10	5	15b	15	25	10a	---	15b	20	40	10	30
Grama, tall----------	---	5c	5c	---	15c	---	---	---	---	---	20d	5c	5b	5c	---	---	5b	5c	10	5b
Green sprangletop----	---	---	5c	---	---	5e	---	---	---	---	20d	5c	5b	5b	---	---	---	---	---	---
Indiangrass----------	45a	15	15a	30b	---	55a	20a	30b	35a	15a	15a	15	5c	10	10a	15a	10a	---	10	---
Knotroot bristlegrass	15b	T	---	5d	---	---	---	5c	---	---	---	---	---	---	---	---	---	---	---	---
Lovegrass, plains----	---	T	T	---	---	5c	---	---	5b	5d	20d	T	---	5c	---	T	5b	---	---	---
Lovegrass, purple----	---	---	---	---	---	---	---	---	---	T	---	---	---	5c	5c	5c	---	---	---	---
Lovegrass, red-------	---	---	---	---	---	---	5c	---	---	---	---	---	---	---	5c	---	---	---	---	---
Lovegrass, sand------	---	---	---	---	---	---	10	5c	---	10	---	---	---	5b	10b	15b	---	---	---	---
Panicum, low---------	T	T	5c	---	---	---	5b	T	5b	---	---	---	---	---	---	5c	---	---	---	---
Panicum, Scribner----	---	---	---	5d	---	5e	5	T	---	5d	---	---	---	5c	5c	5c	---	---	---	5b
Paspalum, Florida----	15b	5c	---	---	---	---	---	5c	---	---	---	---	---	---	---	5c	---	---	---	---
Paspalum, fringeleaf	---	---	---	---	---	---	5b	T	---	5d	---	---	---	---	5c	5c	---	---	---	---
Rush-----------------	---	---	---	5d	---	---	---	T	---	---	---	---	---	---	---	---	---	---	---	---
Sedge----------------	T	T	T	25a	---	5e	---	5c	T	---	T	T	T	---	5c	5c	5b	---	---	---
Seep muhly-----------	---	5c	---	---	---	---	---	---	---	---	---	---	---	---	---	---	5b	---	5b	---
Switchgrass----------	5	5a	15a	30b	---	T	---	20a	5	5d	---	5a	---	---	10a	15a	5	---	---	---
Texas bluegrass------	---	---	---	25a	---	---	---	5c	---	5d	---	---	---	---	---	5c	---	---	---	---
Texas cupgrass-------	15b	5c	15b	---	T	5c	---	---	5b	---	20d	5c	5b	---	---	---	5b	---	---	---
Texas wintergrass----	15b	10b	15b	25a	15b	10d	---	5c	5b	5d	10c	10b	5	5c	---	---	5b	15b	T	10a
Threeawn, perennial--	T	T	5c	---	---	T	5c	---	5b	---	---	T	5b	---	5c	5c	---	5c	T	T
Threeawn, purple-----	T	---	---	---	15c	---	---	---	---	---	20d	---	---	5c	---	---	5b	---	---	---
Threeawn, Wright-----	---	---	---	---	15c	5e	---	---	---	---	20d	T	---	---	---	---	---	---	---	5b
Tridens, purpletop---	---	---	T	5d	---	T	10	20a	---	5	---	T	---	10	15	15a	---	---	---	---
Tridens, rough-------	---	T	T	---	---	---	---	---	---	---	---	---	5b	---	---	---	T	5c	5	---

See footnotes at end of table.

TABLE 7.--PLANT SPECIES COMMON TO EACH RANGE SITE--Continued

Plant species	Range sites																			
	Blackland 1/	Clay Loam 1/	Clay Loam Slope 3/	Clayey Bottomland 1/ 2/ 3/	Claypan Prairie 3/	Deep Redland 1/ 3/	Deep Sand 2/	Loamy Bottomland 1/ 2/	Loamy Prairie 3/	Loamy Sand 2/	Low Stony Hill 3/	Redland 1/ 3/	Rocky Hill 3/	Sandstone Hill 3/	Sandy 2/	Sandy Loam 2/ 3/	Shallow 1/	Shallow Clay 3/	Steep Adobe 1/	Tight Sandy Loam 2/ 3/
Tridens, slim	---	T	T	---	---	---	---	---	---	---	---	---	---	---	---	---	5b	T	T	---
Tridens, white	15b	5c	15b	30b	15c	5c	---	5c	5b	---	---	5c	---	---	---	---	T	---	---	---
Vine-mesquite	15b	5c	15b	30b	10a	15b	---	5c	5b	---	15b	5c	5	5c	---	---	5b	10	---	10
Western wheatgrass	---	---	---	15c	15c	---	---	---	T	---	---	---	---	---	---	---	---	---	---	---
Wildrye, Canada	15b	5a	5c	25a	---	10d	---	20a	T	5d	10c	5a	---	---	---	15b	---	---	---	10a
Wildrye, Virginia	15b	5a	5c	25a	---	---	---	20a	T	---	10c	---	---	---	---	15b	---	---	---	10a
Windmillgrass	T	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	T	5c	---	5b
WOODY PLANTS																				
Agrito	---	---	---	---	---	T	---	---	---	---	---	T	T	---	---	---	---	T	---	5b
Black willow	---	---	---	5b	---	---	---	T	---	---	---	---	---	---	---	---	---	---	---	---
Boxelder	---	---	---	5b	---	---	---	T	---	---	---	---	---	---	---	---	---	---	---	---
Buckthorn	---	---	---	T	---	---	---	5b	---	---	---	---	---	---	---	---	---	---	---	---
Bumelia	---	---	5b	---	---	T	5a	---	---	5a	T	T	T	5a	5a	T	---	---	---	5b
Catclaw	---	---	---	---	---	---	---	---	---	---	---	---	T	5a	---	---	---	T	---	---
Coralberry	---	---	---	5b	---	---	---	5b	---	---	---	---	---	---	5a	5a	---	---	---	5b
Cottonwood	---	---	---	15a	---	---	---	5b	---	---	---	---	---	---	---	---	---	---	---	---
Elbowbush	---	---	5b	---	---	T	---	---	--	---	T	T	T	5a	5a	5a	---	---	---	---
Elm, American	---	---	---	15a	---	---	---	15a	---	---	---	---	---	---	---	---	---	---	---	---
Elm, cedar	T	T	10a	15a	T	T	---	15a	---	---	10a	5a	T	5a	5a	5a	---	---	---	5b
Elm, winged	---	---	---	T	---	T	---	T	---	---	---	---	---	---	---	5a	---	---	---	---
Ephedra	---	---	---	---	T	T	---	---	---	---	---	---	T	---	---	---	---	T	---	---
Grape	---	---	T	5b	---	---	---	5b	---	T	---	---	---	---	5a	5a	---	---	---	---
Greenbrier	---	---	T	5b	---	T	5a	5b	---	5a	T	5a	---	5a	5a	5a	---	---	---	5b
Hackberry	T	T	5b	15a	T	T	---	15a	---	5a	10a	5a	T	---	---	5a	---	T	---	5b
Hawthorn	---	---	---	---	---	---	---	---	---	T	---	---	---	---	5a	5a	---	---	---	---
Honeysuckle	---	---	T	---	---	T	---	T	---	---	T	T	---	T	---	---	---	---	---	---
Juniper	---	---	5b	---	---	---	---	---	---	---	---	---	T	---	---	---	---	---	10a	---
Lotebush	---	---	---	---	T	---	---	---	---	---	---	---	T	5a	---	---	---	T	---	5b
Oak, blackjack	---	---	---	---	---	T	10	---	---	5a	---	T	---	5	5	5	---	---	---	10a
Oak, bur	---	---	---	5b	---	---	---	5b	---	---	---	---	---	---	---	---	---	---	---	---

See footnotes at end of table.

TABLE 7.--PLANT SPECIES COMMON TO EACH RANGE SITE--Continued

Plant species	Range sites																			
	Blackland 1/	Clay Loam 1/	Clay Loam Slope 3/	Clayey Bottomland 1/ 2/ 3/	Claypan Prairie 3/	Deep Redland 1/ 3/	Deep Sand 2/	Loamy Bottomland 1/ 2/	Loamy Prairie 3/	Loamy Sand 2/	Low Stony Hill 3/	Redland 1/ 3/	Rocky Hill 3/	Sandstone Hill 3/	Sandy 2/	Sandy Loam 2/ 3/	Shallow 1/	Shallow Clay 3/	Steep Adobe 1/	Tight Sandy Loam 2/ 3/
Oak, live	T	T	10a	15a	---	5a	---	15a	---	---	10a	5a	10	---	---	---	---	T	10a	---
Oak, post	---	---	---	15a	---	5a	15	15a	---	10	T	T	---	10	10	10	---	---	---	10a
Oak, shin	---	---	T	---	---	T	---	---	---	5a	T	T	---	---	---	---	---	---	---	---
Oak, Texas	---	---	10a	---	---	T	---	---	---	---	10a	---	T	---	---	---	---	---	10a	---
Pecan	---	T	---	15a	---	---	---	15a	---	---	---	---	---	---	---	---	---	---	---	---
Pricklyash	---	---	---	---	---	---	5a	---	---	5a	---	---	---	5a	5a	5a	---	---	---	5b
Pricklypear	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	T	T	---	T
Redbud	---	---	T	---	---	T	---	5b	---	---	T	T	T	---	---	---	---	---	10a	---
Red mulberry	---	---	---	T	---	---	---	5b	---	---	---	---	---	---	---	---	---	---	---	---
Roughleaf dogwood	---	---	5b	T	---	---	---	---	---	---	T	---	---	---	---	T	---	---	---	---
Sumac	---	---	5b	5b	---	T	5a	5b	---	5a	T	T	T	5a	---	---	---	---	10a	5b
Texas ash	---	---	10a	5b	---	T	---	5b	---	---	10a	T	T	5a	---	T	---	---	---	---
Texas sophora	---	---	---	T	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Wild plum	---	T	---	---	---	---	---	---	---	5a	---	---	---	---	5a	5a	---	---	---	5b
Western soapberry	---	---	---	5b	---	---	---	5b	---	5a	---	---	---	---	---	---	---	---	---	---
Woody vines	---	---	---	T	---	---	---	5b	---	---	---	---	---	---	5a	5a	---	---	---	---
Yucca	---	---	T	---	---	---	---	---	---	---	---	---	T	---	---	---	T	---	---	---

1/ Grand Prairie Land Resource Area
2/ Cross Timbers Land Resource Area
3/ North Central Prairie Land Resource Area

TABLE 8.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
AnC Anocon	Slight	Slight	Moderate: slope.	Slight.
Ar. Arents				
Ba Balsora	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Bb Balsora	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.
Bc Balsora	Severe: flooding.	Moderate: flooding, too clayey.	Severe: flooding.	Moderate: flooding.
BdB, BfB Bastsil	Slight	Slight	Slight	Slight.
BkB Blanket	Slight	Slight	Moderate: slope.	Slight.
BoB, BoC Bolar	Slight	Slight	Moderate: slope, small stones.	Slight.
BtC Bonti	Slight	Slight	Moderate: slope, depth to rock.	Severe: erodes easily.
BxC: Bonti	Slight	Slight	Moderate: slope, large stones.	Slight.
Exray	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight.
ByE: Brackett	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.
Aledo	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: slope.
ChB Chaney	Slight	Slight	Moderate: slope.	Slight.
CoB Cisco	Slight	Slight	Moderate: slope.	Slight.
CsE Cona	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope.	Moderate: large stones.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
DaE: Darnell	Severe: large stones, depth to rock.	Severe: large stones, depth to rock.	Severe: large stones, slope, depth to rock.	Moderate: large stones.
Exray	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, slope.	Slight.
De Deleon	Severe: flooding.	Moderate: flooding, too clayey.	Severe: flooding.	Moderate: too clayey, flooding.
DfC, DuB Duffau	Slight	Slight	Moderate: slope.	Slight.
DvC4: Duffau	Slight	Slight	Moderate: slope.	Slight.
Gullied land.				
Fr Frio	Severe: flooding.	Severe: too clayey.	Severe: too clayey.	Moderate: too clayey.
HaB Hassee	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Slight.
HeB Hensley	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, depth to rock.	Moderate: large stones.
KtC, KtC3 Keeter	Slight	Slight	Moderate: slope.	Slight.
LnB Lindy	Slight	Slight	Severe: small stones.	Slight.
MaB May	Slight	Slight	Slight	Severe: erodes easily.
MdE: Medlin	Moderate: slope, percs slowly, too clayey.	Moderate: slope, too clayey, percs slowly.	Severe: slope.	Moderate: too clayey.
Sanger	Moderate: slope, percs slowly, too clayey.	Moderate: slope, too clayey, percs slowly.	Severe: slope.	Moderate: too clayey.
MoB Mingo	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock, percs slowly.	Slight.
NdB Nimrod	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
OwE Owens	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: large stones, slope.
PaC Palopinto	Severe: large stones, depth to rock.	Severe: large stones, depth to rock.	Severe: large stones, depth to rock.	Severe: large stones.
PhC:				
Patilo	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
Heaton	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Po. Pits				
PrB Ponder	Slight	Slight	Moderate: slope.	Slight.
Ps Pulexas	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Pu Pulexas	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.
PvB Purves	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Moderate: too clayey.
SaB, SaC Sanger	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.
SaD Sanger	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Severe: slope.	Moderate: too clayey.
SbB San Saba	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, small stones, too clayey.	Moderate: too clayey.
SdB Selden	Slight	Slight	Moderate: slope.	Slight.
SeE Set	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Moderate: large stones, too clayey.
SfC, SfC3 Silawa	Slight	Slight	Moderate: slope.	Slight.
SgA Slidell	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly.	Moderate: too clayey.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails
SgB Slidell	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.
SoC:				
Somervell	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.
Aledo	Severe: depth to rock.	Severe: depth to rock.	Severe: small stones, depth to rock.	Slight.
SpB Speck	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight.
ThB Thurber	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.
Tr Trinity	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness.	Severe: wetness, too clayey.
TuB, TuC, TuC3 Truce	Slight	Slight	Moderate: slope.	Slight.
VeB, VeC Venus	Slight	Slight	Moderate: slope.	Slight.
VrC Vernon	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Slight.
WeC , WeC3:				
Weatherford	Slight	Slight	Moderate: slope.	Severe: erodes easily.
Duffau	Slight	Slight	Moderate: slope.	Slight.
Wf Westfork	Severe: flooding.	Moderate: too clayey, percs slowly.	Moderate: too clayey, flooding, percs slowly.	Moderate: too clayey.
WtC, WtC3 Windthorst	Slight	Slight	Moderate: slope.	Severe: erodes easily.
WzC Wise	Slight	Slight	Moderate: slope.	Slight.

TABLE 9.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
AnC Anocon	Good	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
Ar. Arents									
Ba Balsora	Good	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
Bb, Bc Balsora	Very poor	Fair	Good	Good	Poor	Very poor	Poor	Very poor	Good.
BdB Bastsil	Fair	Fair	Good	Good	Poor	Very poor	Fair	Very poor	Good.
BfB Bastsil	Good	Fair	Good	Good	Poor	Very poor	Good	Very poor	Good.
BkB Blanket	Good	Good	Fair	Good	Poor	Very poor	Good	Very poor	Fair.
BoB Bolar	Good	Good	Fair	Fair	Poor	Very poor	Good	Very poor	Fair.
BoC Bolar	Fair	Good	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
BtC Bonti	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
BxC:									
Bonti	Poor	Poor	Good	Good	Poor	Very poor	Fair	Very poor	Good.
Exray	Poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
ByE:									
Brackett	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Very poor	Very poor	Fair.
Aledo	Very poor	Very poor	Poor	Fair	Very poor	Very poor	Very poor	Very poor	Poor.
ChB Chaney	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
CoB Cisco	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
CsE Cona	Poor	Fair	Good	Good	Very poor	Very poor	Fair	Very poor	Fair.
DaE:									
Darnell	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
Exray	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
De Deleon	Very poor	Poor	Fair	Fair	Poor	Poor	Poor	Poor	Fair.

TABLE 9.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
DfC Duffau	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
DuB Duffau	Good	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
DvC4:									
Duffau	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
Gullied land.									
Fr Frio	Good	Good	Fair	Good	Poor	Very poor	Good	Very poor	Fair.
HaB Hassee	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
HeB Hensley	Poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
KtC Keeter	Poor	Good	Good	Good	Very poor	Very poor	Fair	Very poor	Good.
KtC3 Keeter	Poor	Fair	Good	Fair	Very poor	Very poor	Fair	Very poor	Fair.
LnB Lindy	Fair	Good	Good	Good	Very poor	Very poor	Good	Very poor	Good.
MaB May	Good	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
MdE:									
Medlin	Poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
Sanger	Poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
MoB Mingo	Fair	Good	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
NdB Nimrod	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
OwE Owens	Very poor	Very poor	Fair	Fair	Very poor	Very poor	Very poor	Very poor	Poor.
PaC Palopinto	Poor	Poor	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
PhC:									
Patilo	Fair	Good	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.
Heaton	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
Po. Pits									
PrB Ponder	Fair	Fair	Good	Fair	Poor	Very poor	Fair	Very poor	Fair.

TABLE 9.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
Ps----------------- Pulexas	Good	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
Pu----------------- Pulexas	Very poor	Poor	Fair	Good	Poor	Very poor	Poor	Very poor	Fair.
PvB---------------- Purves	Fair	Good	Poor	Fair	Poor	Very poor	Fair	Very poor	Poor.
SaB---------------- Sanger	Good	Good	Fair	Fair	Poor	Very poor	Good	Very poor	Fair.
SaC, SaD----------- Sanger	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Very poor	Fair.
SbB---------------- San Saba	Fair	Fair	Fair	Fair	Poor	Poor	Fair	Poor	Fair.
SdB---------------- Selden	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
SeE---------------- Set	Very poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
SfC, SfC3---------- Silawa	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
SgA, SgB----------- Slidell	Good	Good	Fair	Fair	Poor	Very poor	Good	Very poor	Fair.
SoC:									
Somervell----------	Poor	Poor	Fair	Fair	Very poor	Very poor	Poor	Very poor	Fair.
Aledo--------------	Poor	Poor	Poor	Fair	Very poor	Very poor	Poor	Very poor	Poor.
SpB---------------- Speck	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Very poor	Fair.
ThB---------------- Thurber	Fair	Fair	Fair	Fair	Poor	Poor	Fair	Poor	Fair.
Tr----------------- Trinity	Fair	Good	Fair	Fair	Poor	Fair	Fair	Poor	Fair.
TuB---------------- Truce	Good	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
TuC---------------- Truce	Fair	Good	Good	Good	Poor	Very poor	Fair	Very poor	Good.
TuC3--------------- Truce	Fair	Good	Good	Good	Poor	Very poor	Fair	Very poor	Good.
VeB---------------- Venus	Good	Good	Good	Fair	Poor	Very poor	Good	Very poor	Fair.
VeC---------------- Venus	Fair	Good	Good	Fair	Poor	Very poor	Good	Very poor	Fair.

TABLE 9.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements						Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Wetland wildlife	Rangeland wildlife
VrC---------------- Vernon	Fair	Fair	Poor	Fair	Poor	Very poor	Fair	Very poor	Fair.
WeC, WeC3:									
Weatherford--------	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
Duffau-------------	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
Wf----------------- Westfork	Fair	Fair	Poor	Fair	Poor	Poor	Fair	Poor	Poor.
WtC, WtC3---------- Windthorst	Fair	Good	Good	Good	Poor	Very poor	Good	Very poor	Good.
WzC---------------- Wise	Fair	Fair	Fair	Fair	Poor	Very poor	Fair	Very poor	Fair.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AnC Anocon	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Ar. Arents						
Ba Balsora	Moderate: too clayey, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
Bb Balsora	Moderate: too clayey, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
Bc Balsora	Moderate: too clayey, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding, too clayey.
BdB, BfB Bastsil	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Slight.
BkB Blanket	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
BoB Bolar	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: thin layer.
BoC Bolar	Moderate: depth to rock.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: thin layer.
BtC Bonti	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: low strength.	Moderate: thin layer.
BxC: Bonti	Severe: depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: low strength.	Moderate: large stones.
Exray	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, low strength.	Severe: thin layer.
ByE: Brackett	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.	Moderate: small stones, droughty, slope.
Aledo	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, thin layer.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
ChB------------- Chaney	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
CoB------------- Cisco	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Slight.
CsE------------- Cona	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: large stones, slope.
DaE:						
Darnell---------	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.	Severe: thin layer.
Exray-----------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, low strength.	Severe: thin layer.
De-------------- Deleon	Moderate: too clayey, flooding.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, flooding, shrink-swell.	Severe: flooding, too clayey.
DfC, DuB-------- Duffau	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: low strength.	Slight.
DvC4:						
Duffau----------	Slight---------	Slight---------	Slight---------	Moderate: slope.	Moderate: low strength.	Slight.
Gullied land.						
Fr-------------- Frio	Moderate: too clayey, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: too clayey.
HaB------------- Hassee	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
HeB------------- Hensley	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, low strength.	Severe: large stones, thin layer.
KtC------------- Keeter	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Severe: low strength.	Slight.
KtC3------------ Keeter	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
LnB------------- Lindy	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: low strength.	Moderate: thin layer.
MaB------------- May	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Slight.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
MdE: Medlin	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: slope, shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
Sanger	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Severe: too clayey.
MoB Mingo	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: thin layer.
NdB Nimrod	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
OwE Owens	Severe: slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, slope, low strength.	Severe: large stones, slope, too clayey.
PaC Palopinto	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, low strength.	Severe: large stones, thin layer.
PhC: Patilo	Severe: cutbanks cave.	Slight	Moderate: wetness.	Moderate: slope.	Slight	Moderate: droughty.
Heaton	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Po. Pits						
PrB Ponder	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Ps Pulexas	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Pu Pulexas	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
PvB Purves	Severe: depth to rock.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, low strength, shrink-swell.	Severe: depth to rock, too clayey.
SaB, SaC, SaD Sanger	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
SbB San Saba	Severe: depth to rock, cutbanks cave.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
SdB Selden	Slight	Slight	Slight	Slight	Slight	Slight.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
SeE Set	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: large stones, slope, too clayey.
SfC, SfC3 Silawa	Slight	Slight	Slight	Moderate: slope.	Slight	Slight.
SgA, SgB Slidell	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
SoC: Somervell	Severe: depth to rock.	Moderate: depth to rock, large stones.	Severe: depth to rock.	Moderate: slope, depth to rock, large stones.	Moderate: depth to rock, large stones.	Severe: small stones, large stones, droughty.
Aledo	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock, slope.	Moderate: depth to rock.	Severe: thin layer.
SpB Speck	Severe: depth to rock.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, low strength, shrink-swell.	Severe: thin layer.
ThB Thurber	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Tr Trinity	Severe: cutbanks cave, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, flooding.	Severe: wetness, too clayey.
TuB Truce	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: droughty.
TuC Truce	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: droughty.
TuC3 Truce	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: droughty.
VeB Venus	Slight	Slight	Slight	Slight	Moderate: low strength.	Slight.
VeC Venus	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.	Slight.
VrC Vernon	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: too clayey.
WeC, WeC3: Weatherford	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.	Slight.
Duffau	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.	Slight.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Wf Westfork	Moderate: too clayey, flooding.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, flooding, shrink-swell.	Severe: too clayey.
WtC Windthorst	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
WtC3 Windthorst	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
WzC Wise	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, shrink-swell.	Slight.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AnC Anocon	Severe: percs slowly.	Severe: seepage.	Severe: too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
Ar. Arents					
Ba, Bb, Bc Balsora	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey, thin layer.
BdB, BfB Bastsil	Moderate: percs slowly.	Severe: seepage.	Slight	Slight	Good.
BkB Blanket	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
BoB, BoC Bolar	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, hard to pack.
BtC Bonti	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey.
BxC:					
Bonti	Severe: percs slowly, depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, thin layer.
Exray	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, large stones.
ByE:					
Brackett	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: thin layer.
Aledo	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
ChB Chaney	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
CoB Cisco	Slight	Severe: seepage.	Severe: seepage.	Slight	Good.
CsE Cona	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.

TABLE 11.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
DaF: Darnell	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim.
Exray	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, large stones.
De Deleon	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.
DfC, DuB Duffau	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
DvC4: Duffau	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Gullied land.					
Fr Frio	Severe: flooding, percs slowly.	Slight	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.
HaB Hassee	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
HeB Hensley	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
KtC, KtC3 Keeter	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too sandy.	Slight	Fair: too sandy.
LnB Lindy	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
MaB May	Slight	Moderate: seepage.	Slight	Slight	Good.
MdE: Medlin	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Sanger	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.

TABLE 11.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MoB Mingo	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
NdB Nimrod	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage.	Fair: wetness.
OwE Owens	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, too clayey, hard to pack.
PaC Palopinto	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim, hard to pack, large stones.
PhC:					
Patilo	Slight	Severe: seepage, slope.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Heaton	Moderate: percs slowly.	Severe: seepage.	Slight	Severe: seepage.	Good.
Po. Pits					
PrB Ponder	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Ps, Pu Pulexas	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Good.
PvB Purves	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
SaB, SaC, SaD Sanger	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
SbB San Saba	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
SdB Selden	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
SeE Set	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.

TABLE 11.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
SfC, SfC3 Silawa	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
SgA Slidell	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
SgB Slidell	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
SoC: Somervell	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones.
Aledo	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones.
SpB Speck	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
ThB Thurber	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Tr Trinity	Severe: flooding, wetness, percs slowly.	Slight	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
TuB, TuC, TuC3 Truce	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
VeB, VeC Venus	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
VrC Vernon	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
WeC, WeC3: Weatherford	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Duffau	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Wf Westfork	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, hard to pack.

TABLE 11.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
WtC, WtC3----------- Windthorst	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
WzC----------------- Wise	Slight-----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too clayey.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
AnC Anocon	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Ar. Arents				
Ba, Bb Balsora	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Bc Balsora	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
BdB, BfB Bastsil	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
BkB Blanket	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
BoB, BoC Bolar	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
BtC Bonti	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
BxC: Bonti	Poor: low strength, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Exray	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
ByE: Brackett	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Aledo	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
ChB Chaney	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
CoB Cisco	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, thin layer.
CsE Cona	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
DaE: Darnell	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones.
Exray	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones.
De Deleon	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
DfC Duffau	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
DuB Duffau	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
DvC4: Duffau	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Gullied land.				
Fr Frio	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
HaB Hassee	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
HeB Hensley	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
KtC, KtC3 Keeter	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
LnB Lindy	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
MaB May	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
MdE: Medlin	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Sanger	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
MoB Mingo	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
NdB Nimrod	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
OwE Owens	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones, too clayey.
PaC Palopinto	Poor: area reclaim, low strength, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones.
PhC: Patilo	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Heaton	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
Po. Pits				
PrB Ponder	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Ps, Pu Pulexas	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
PvB Purves	Poor: depth to rock, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, small stones.
SaB, SaC, SaD Sanger	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
SbB San Saba	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
SdB Selden	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
SeF Set	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, large stones.
SfC, SfC3 Silawa	Good	Probable	Probable	Fair: area reclaim.
SgA, SgB Slidell	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
SoC:				
Somervell	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Aledo	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
SpB Speck	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
ThB Thurber	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Tr Trinity	Poor: wetness, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
TuB, TuC, TuC3 Truce	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
VeB, VeC Venus	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
VrC Vernon	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
WeC, WeC3:				
Weatherford	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Duffau	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Wf Westfork	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
WtC, WtC3 Windthorst	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
WzC Wise	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Limitations for--		Features affecting--	
	Pond reservoir areas	Embankments, dikes, and levees	Terraces and diversions	Grassed waterways
AnC Anocon	Slight	Slight	Favorable	Favorable.
Ar. Arents				
Ba, Bb, Bc Balsora	Moderate: seepage.	Severe: piping.	Erodes easily	Erodes easily.
BdB, BfB Bastsil	Moderate: seepage.	Moderate: piping.	Soil blowing	Favorable.
BkB Blanket	Moderate: seepage.	Moderate: hard to pack.	Erodes easily	Erodes easily.
BoB, BoC Bolar	Moderate: seepage, depth to rock.	Moderate: thin layer, hard to pack.	Depth to rock, percs slowly.	Depth to rock, percs slowly.
BtC Bonti	Moderate: depth to rock.	Severe: thin layer.	Depth to rock, erodes easily, soil blowing.	Erodes easily, depth to rock.
BxC:				
Bonti	Moderate: depth to rock.	Moderate: thin layer.	Depth to rock	Depth to rock.
Exray	Severe: depth to rock.	Severe: thin layer.	Depth to rock	Depth to rock.
ByE:				
Brackett	Severe: slope.	Moderate: piping.	Slope	Slope, droughty.
Aledo	Severe: depth to rock, slope.	Severe: thin layer.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
ChB Chaney	Slight	Severe: hard to pack.	Soil blowing, percs slowly.	Percs slowly, rooting depth.
CoB Cisco	Moderate: seepage.	Moderate: piping.	Favorable	Favorable.
CsE Cona	Severe: slope.	Severe: thin layer.	Slope, large stones.	Large stones, slope, percs slowly.
DaE:				
Darnell	Severe: depth to rock, slope, seepage.	Severe: piping, thin layer.	Slope, depth to rock.	Slope, depth to rock.
Exray	Severe: depth to rock.	Severe: thin layer.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.

TABLE 15.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--	
	Pond reservoir areas	Embankments, dikes, and levees	Terraces and diversions	Grassed waterways
De Deleon	Slight	Severe: hard to pack.	Percs slowly	Percs slowly.
DfC Duffau	Moderate: seepage.	Slight	Soil blowing	Favorable.
DuB Duffau	Moderate: seepage.	Slight	Erodes easily, soil blowing.	Erodes easily.
DvC4:				
Duffau	Moderate: seepage.	Slight	Erodes easily, soil blowing.	Erodes easily.
Gullied land.				
Fr Frio	Slight	Moderate: hard to pack.	Favorable	Favorable.
HaB Hassee	Slight	Moderate: hard to pack, wetness.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
HeB Hensley	Severe: depth to rock.	Severe: thin layer.	Large stones, depth to rock, erodes easily.	Large stones, erodes easily, droughty.
KtC, KtC3 Keeter	Moderate: seepage.	Severe: piping.	Erodes easily, soil blowing.	Erodes easily.
LnB Lindy	Moderate: depth to rock.	Severe: thin layer.	Depth to rock, percs slowly.	Depth to rock, percs slowly.
MaB May	Moderate: seepage.	Moderate: piping.	Erodes easily, soil blowing.	Erodes easily.
MdE:				
Medlin	Slight	Moderate: hard to pack.	Slope, percs slowly, large stones.	Slope, percs slowly, large stones.
Sanger	Slight	Slight	Slope, percs slowly.	Slope, percs slowly.
MoB Mingo	Moderate: depth to rock.	Severe: thin layer.	Depth to rock, percs slowly.	Depth to rock, percs slowly.
NdB Nimrod	Severe: seepage.	Moderate: thin layer, piping, wetness.	Wetness, soil blowing.	Droughty.
OwE Owens	Slight	Moderate: hard to pack, large stones.	Large stones, slope, erodes easily.	Large stones, slope, erodes easily.
PaC Palopinto	Severe: depth to rock.	Severe: large stones.	Large stones, depth to rock.	Large stones, depth to rock.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--	
	Pond reservoir areas	Embankments, dikes, and levees	Terraces and diversions	Grassed waterways
PhC:				
Patilo	Severe: seepage.	Severe: seepage, piping.	Too sandy, soil blowing.	Droughty.
Heaton	Severe: seepage.	Slight	Soil blowing	Droughty.
Po. Pits				
PrB Ponder	Slight	Severe: hard to pack.	Percs slowly, erodes easily.	Percs slowly, erodes easily.
Ps, Pu Pulexas	Severe: seepage.	Severe: piping.	Soil blowing	Favorable.
PvB Purves	Severe: depth to rock.	Severe: thin layer.	Depth to rock	Depth to rock.
SaB, SaC, SaD Sanger	Slight	Severe: hard to pack.	Percs slowly	Percs slowly.
SbB San Saba	Moderate: depth to rock.	Severe: hard to pack.	Depth to rock, percs slowly.	Depth to rock, percs slowly.
SdB Selden	Slight	Moderate: piping.	Soil blowing	Favorable.
SeE Set	Slight	Moderate: hard to pack, large stones.	Slope, percs slowly.	Large stones, slope, percs slowly.
SfC, SfC3 Silawa	Severe: seepage.	Moderate: piping.	Favorable	Favorable.
SgA, SgB Slidell	Slight	Moderate: hard to pack.	Percs slowly	Percs slowly.
SoC:				
Somervell	Moderate: seepage, depth to rock, slope.	Moderate: thin layer, large stones.	Large stones, depth to rock.	Large stones, droughty.
Aledo	Severe: depth to rock.	Severe: thin layer.	Large stones, depth to rock.	Large stones, droughty.
SpB Speck	Severe: depth to rock.	Severe: thin layer.	Depth to rock, percs slowly.	Depth to rock, percs slowly.
ThB Thurber	Slight	Severe: hard to pack.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Tr Trinity	Slight	Severe: hard to pack, wetness.	Wetness, percs slowly.	Wetness, percs slowly.
TuB, TuC, TuC3 Truce	Slight	Moderate: hard to pack.	Percs slowly, soil blowing, erodes easily.	Percs slowly, droughty, erodes easily.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--	
	Pond reservoir areas	Embankments, dikes, and levees	Terraces and diversions	Grassed waterways
VeB, VeC Venus	Severe: seepage.	Severe: piping.	Favorable	Favorable.
VrC Vernon	Moderate: slope.	Moderate: hard to pack.	Erodes easily, percs slowly.	Erodes easily, droughty.
WeC, WeC3:				
Weatherford	Moderate: seepage.	Moderate: thin layer.	Erodes easily, soil blowing.	Erodes easily.
Duffau	Moderate: seepage.	Slight	Erodes easily, soil blowing.	Erodes easily.
Wf Westfork	Slight	Moderate: hard to pack.	Percs slowly	Percs slowly.
WtC, WtC3 Windthorst	Slight	Moderate: hard to pack.	Erodes easily, soil blowing.	Erodes easily.
WzC Wise	Severe: seepage.	Severe: piping.	Erodes easily	Erodes easily.

TABLE 14.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated. Some soils may have Unified classifications and USDA textures in addition to those shown. In general, the dominant classifications and textures are shown]

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AnC Anocon	0-13	Loam	CL-ML, CL	A-4, A-6	0	95-100	95-100	85-100	50-80	20-30	4-14
	13-56	Clay, clay loam	CL, CH	A-6, A-7	0	95-100	95-100	90-100	55-85	30-53	15-33
	56-70	Sandy clay loam, clay loam.	SC, CL	A-6, A-7, A-4	0	90-100	90-100	85-100	40-85	25-48	8-31
Ar. Arents											
Ba Balsora	0-6	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	90-100	75-98	20-35	5-16
	6-62	Stratified very fine sandy loam to silty clay loam.	CL-ML, CL	A-4, A-6, A-7-6	0	100	100	95-100	80-100	20-50	5-30
Bb Balsora	0-6	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	90-100	75-98	20-35	5-16
	6-52	Stratified very fine sandy loam to silty clay loam.	CL-ML, CL	A-4, A-6, A-7-6	0	100	100	95-100	80-100	20-50	5-30
	52-64	Silty clay loam, silty clay.	CL, CH	A-6, A-7-6	0	100	100	95-100	80-100	30-59	11-35
Bc Balsora	0-9	Silty clay	CL, CH	A-6, A-7-6	0	100	100	95-100	80-100	30-59	11-35
	9-44	Stratified very fine sandy loam to silty clay loam.	CL-ML, CL	A-4, A-6, A-7-6	0	100	100	95-100	80-100	20-50	5-30
	44-60	Silty clay loam, silty clay.	CL, CH	A-6, A-7-6	0	100	100	95-100	80-100	30-59	11-35
BdB Bastsil	0-17	Loamy fine sand	SM, SM-SC	A-2-4, A-4	0	95-100	95-100	75-95	20-50	<20	NP-4
	17-65	Sandy clay loam	CL, SC	A-6	0	95-100	90-100	75-100	40-70	26-40	11-24
BfB Bastsil	0-15	Fine sandy loam	ML, SM, CL-ML, SM-SC	A-4	0	95-100	95-100	75-100	36-70	<25	NP-7
	15-80	Sandy clay loam	CL, SC	A-6	0	95-100	90-100	75-100	40-70	26-40	11-24
BkB Blanket	0-18	Clay loam	CL, CH	A-6, A-7	0	95-100	95-100	90-100	65-95	28-62	12-38
	18-41	Clay loam, clay, silty clay.	CL, CH	A-7	0	95-100	95-100	85-100	70-90	41-64	20-38
	41-80	Clay loam	CL	A-6, A-7	0	85-100	80-100	80-100	51-85	30-50	15-30
BoB Bolar	0-12	Clay loam	CL, CH	A-6, A-7	0-5	85-100	78-100	70-100	55-85	35-57	18-34
	12-32	Loam, clay loam, silty clay loam.	CL, CH	A-6, A-7	0-5	85-100	78-100	70-99	55-85	34-59	16-38
	32-47	Weathered bedrock	---	---	---	---	---	---	---	---	---
BoC Bolar	0-12	Clay loam	CL, CH	A-6, A-7	0-5	85-100	78-100	70-100	55-85	35-57	18-34
	12-34	Loam, clay loam, silty clay loam.	CL, CH	A-6, A-7	0-5	85-100	78-100	70-99	55-85	34-59	16-38
	34-60	Weathered bedrock	---	---	---	---	---	---	---	---	---

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
BtC--------------- Bonti	0-8	Fine sandy loam--	SM, SM-SC, ML, CL-ML	A-4, A-2-4	0-2	90-100	90-100	70-100	25-70	<30	NP-10
	8-26	Clay, clay loam, sandy clay.	CL	A-6, A-7	0-4	80-100	80-100	70-100	51-75	30-45	18-25
	26-36	Weathered bedrock	---	---	---	---	---	---	---	---	---
BxC: Bonti------------	0-11	Stony fine sandy loam.	SM, SM-SC, ML, CL-ML	A-2-4, A-4	5-15	80-100	80-100	70-98	25-70	18-30	2-7
	11-30	Clay, sandy clay, clay loam.	CL	A-6, A-7	0-15	80-100	80-100	75-100	55-75	30-45	18-25
	30-34	Weathered bedrock	---	---	---	---	---	---	---	---	---
Exray------------	0-6	Stony fine sandy loam.	SM-SC, SC	A-2-4, A-4	5-23	85-100	80-100	55-80	30-50	20-30	5-10
	6-16	Clay, sandy clay, clay loam.	CL, SC	A-6, A-7	0-5	85-100	80-100	80-100	48-80	30-45	15-25
	16-40	Weathered bedrock	---	---	---	---	---	---	---	---	---
ByF: Brackett--------	0-6	Gravelly loam----	CL, SC, GC	A-6	0-15	70-99	62-88	50-79	43-72	25-40	10-23
	6-18	Loam, clay loam, gravelly loam, gravelly clay loam.	CL	A-6, A-7-6	0-3	90-100	85-100	65-94	60-87	25-43	10-26
	18-40	Loam, clay loam, gravelly loam, gravelly clay loam.	CL	A-6, A-7-6	0-3	90-100	85-100	68-98	67-97	25-43	10-26
Aledo------------	0-6	Gravelly loam----	CL, GC, SC	A-4, A-6, A-7	0-20	65-95	60-90	55-90	40-70	27-42	8-22
	6-13	Very gravelly clay loam, very gravelly loam.	GC, SC	A-2-4, A-2-6	5-25	35-65	30-50	25-50	15-35	27-40	8-20
	13-20	Weathered bedrock	---	---	---	---	---	---	---	---	---
ChB-------------- Chaney	0-12	Loamy fine sand--	SM, SM-SC, SP-SM	A-2-4, A-4, A-3	0	80-100	80-100	65-98	7-45	<25	NP-4
	12-40	Clay, sandy clay	CL, CH	A-7-6	0	90-100	90-100	90-100	43-85	39-60	24-42
	40-46	Sandy clay, sandy clay loam.	CL, CH, SC	A-6, A-7-6, A-2-6, A-2-7	0	90-100	90-100	80-100	30-70	25-55	11-40
	46-72	Clay, sandy clay loam, sandy clay, shaly clay.	CL, CH, SC, SM-SC	A-6, A-7-6, A-2, A-4	0	90-100	90-100	80-100	25-85	25-60	6-40
CoB-------------- Cisco	0-13	Loamy sand-------	SM, SM-SC	A-4, A-2-4	0	95-100	95-100	80-100	12-41	<25	NP-4
	13-40	Sandy clay loam	SC, CL	A-6	0	95-100	95-100	85-100	40-60	25-40	11-25
	40-60	Sandy clay loam, fine sandy loam, loamy sand.	SC, SM, SM-SC	A-4, A-6, A-2-4	0	95-100	94-100	80-95	25-50	<35	NP-15
CsE-------------- Cona	0-9	Very stony sandy loam.	SM, SC, SM-SC	A-2-4, A-4	15-30	85-100	80-100	65-95	25-50	15-25	2-8
	9-32	Sandy clay, clay	CL, CH	A-6, A-7	0-20	80-100	75-100	70-95	60-85	36-65	20-45
	32-60	Shaly clay, sandy clay, clay.	CL, CH	A-7, A-6	0-10	80-100	75-100	65-95	60-85	40-65	22-45

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
DaE: Darnell	0-3	Very stony fine sandy loam.	SM, SC, SM-SC	A-4, A-2	15-30	90-100	90-100	85-100	30-50	<30	NP-10
	3-11	Fine sandy loam, gravelly fine sandy loam.	SM, SC, SM-SC	A-4, A-2	0-10	70-100	70-100	60-100	25-50	<30	NP-10
	11-14	Weathered bedrock	---	---	---	---	---	---	---	---	---
Exray	0-7	Very stony fine sandy loam.	SM-SC, SC	A-2-4, A-4	15-40	85-100	80-100	55-80	30-50	20-30	5-10
	7-16	Clay, sandy clay, clay loam.	CL, SC	A-6, A-7	0-5	85-100	80-100	80-100	48-80	30-45	15-25
	16-20	Weathered bedrock	---	---	---	---	---	---	---	---	---
De Deleon	0-6	Silty clay	CH, CL	A-7	0	95-100	95-100	95-100	85-100	41-60	25-41
	6-75	Clay, silty clay	CH, CL	A-7	0	95-100	95-100	95-100	85-100	41-60	25-41
	75-80	Clay, silty clay, silty clay loam.	CH, CL	A-7, A-6	0	95-100	95-100	90-100	70-100	35-60	20-41
DfC Duffau	0-17	Loamy fine sand	SM, SM-SC	A-2-4, A-4	0	95-100	95-100	75-98	15-40	<22	NP-4
	17-80	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0	95-100	95-100	80-100	36-65	30-40	15-24
DuB Duffau	0-12	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4, A-2-4	0	95-100	95-100	75-100	30-60	<25	NP-7
	12-61	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0	95-100	95-100	80-100	36-65	30-40	15-24
	61-69	Sandy clay loam, fine sandy loam, very fine sandy loam.	SC, CL, CL-ML, SM	A-4, A-6	0	95-100	95-100	80-100	40-65	20-36	2-18
	69-80	Weathered bedrock	---	---	---	---	---	---	---	---	---
DvC4: Duffau	0-8	Very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	0	95-100	95-100	80-100	36-65	<28	NP-7
	8-80	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0	95-100	95-100	80-100	36-65	30-40	15-24
Gullied land.											
Fr Frio	0-10	Silty clay loam	CL, CH	A-6, A-7	0-2	90-100	85-100	85-100	69-96	36-59	17-34
	10-80	Silty clay, silty clay loam, clay loam.	CL, CH	A-6, A-7	0-5	90-100	90-100	85-100	68-96	36-59	17-34
HaB Hassee	0-11	Fine sandy loam	CL	A-4, A-6	0	95-100	95-100	80-100	50-80	20-35	8-16
	11-48	Clay	CH, CL	A-7-6	0	95-100	95-100	95-100	75-95	41-62	24-41
	48-80	Clay, clay loam.	CH, CL	A-7-6, A-6	0	95-100	95-100	90-100	70-95	35-52	20-35
HeB Hensley	0-4	Very stony loam	CL, CL-ML	A-4, A-6	20-50	80-100	75-100	70-100	60-90	20-40	5-20
	4-18	Clay, clay loam	CL, CH	A-6, A-7	0-10	80-100	75-100	70-100	65-95	35-55	18-35
	18-22	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
KtC---------------- Keeter	0-7	Very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	0	98-100	95-100	95-100	42-71	<30	NP-7
	7-15	Sandy clay, clay loam, sandy clay loam.	CL	A-6, A-7	0	95-100	95-100	90-100	66-96	35-49	16-28
	15-33	Clay loam, sandy clay loam, loam, very fine sandy loam.	CL	A-4, A-6, A-7	0	95-100	95-100	90-100	66-96	28-44	8-22
	33-72	Very fine sandy loam, loam, loamy fine sand.	CL-ML, ML, SM, SM-SC, CL	A-4, A-2-4	0	95-100	95-100	75-100	20-79	<30	NP-10
KtC3-------------- Keeter	0-3	Very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	0	98-100	95-100	95-100	42-71	<30	NP-7
	3-18	Sandy clay, clay loam, sandy clay loam.	CL	A-6, A-7	0	95-100	95-100	90-100	66-96	35-49	16-28
	18-38	Clay loam, sandy clay loam, loam, very fine sandy loam.	CL	A-4, A-6, A-7	0	95-100	95-100	90-100	66-96	28-44	8-22
	38-72	Very fine sandy loam, loam, loamy fine sand.	CL-ML, ML, SM, SM-SC, CL	A-4, A-2-4	0	95-100	95-100	75-100	20-79	<30	NP-10
LnB--------------- Lindy	0-6	Loam--------------	CL, CL-ML	A-4, A-6	0-3	95-100	90-100	80-100	65-90	20-40	5-20
	6-24	Clay loam, clay	CL, CH	A-6, A-7	0-3	95-100	95-100	90-100	65-90	35-60	15-35
	24-40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
MaB--------------- May	0-14	Fine sandy loam--	SM, ML, CL-ML, SM-SC	A-4	0	95-100	95-100	80-100	40-60	<25	NP-7
	14-42	Sandy clay loam, clay loam.	SC, CL	A-6	0	95-100	95-100	80-100	40-70	25-40	12-25
	42-64	Sandy clay loam, fine sandy loam, loam.	SC, CL	A-4, A-6	0	95-100	95-100	75-100	40-70	20-40	8-25
MdE:											
Medlin-----------	0-7	Stony clay--------	CH, CL	A-7-6	2-15	90-100	90-100	85-100	75-95	45-70	26-45
	7-44	Clay, silty clay	CH, CL	A-7-6	0-2	90-100	90-100	85-100	75-95	45-70	26-45
	44-60	Clay, silty clay	CL, CH	A-7-6	0	90-100	90-100	75-100	70-95	46-79	28-54
Sanger-----------	0-16	Stony clay--------	CH	A-7-6	2-20	90-100	90-100	85-100	75-95	51-70	28-42
	16-44	Clay, silty clay	CL, CH	A-7-6	0	90-100	90-100	75-100	70-99	40-60	20-36
	44-62	Clay, silty clay	CH, CL	A-7-6	0	90-100	90-100	85-100	80-100	40-55	20-35
MoB--------------- Mingo	0-7	Silty clay loam--	CL, CH	A-6, A-4, A-7	0	95-100	90-100	70-100	65-94	25-54	8-32
	7-33	Clay, silty clay loam, silty clay.	CH, CL	A-7	0	90-100	85-100	75-100	65-95	42-65	22-40
	33-44	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
NdB-------------- Nimrod	0-24	Fine sand--------	SP-SM, SM, SM-SC	A-2-4, A-3	0	95-100	95-100	90-100	8-28	<25	NP-4
	24-62	Sandy clay loam, clay loam.	SC, CL	A-6, A-2-6	0	95-100	95-100	90-100	25-55	22-30	11-16
	62-80	Sandy loam, sandy clay loam, loamy fine sand.	SC, CL, SM-SC, CL-ML, SM	A-4, A-6, A-2-4, A-2-6	0	95-100	95-100	90-100	15-55	18-28	2-11
OwE-------------- Owens	0-7	Very stony clay--	CL, CH	A-7-6	15-35	80-100	75-100	70-100	65-95	45-60	22-32
	7-18	Clay, silty clay	CL, CH	A-7-6	0-10	80-100	80-100	80-100	75-95	45-60	22-33
	18-40	Very shaly clay, shaly clay, clay.	CL, CH	A-7-6	0-10	90-100	85-100	80-100	65-95	45-60	25-37
PaC-------------- Palopinto	0-4	Extremely stony silty clay loam.	CH, CL	A-7-6, A-6	25-55	85-100	85-100	75-100	70-95	39-58	17-31
	4-15	Extremely stony clay loam, extremely stony silty clay loam, extremely stony loam.	CH, CL	A-7-6, A-6	50-85	65-100	65-100	60-100	51-95	39-58	17-31
	15-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
PhC:											
Patilo----------	0-43	Fine sand--------	SM, SP-SM, SM-SC	A-2-4, A-3	0	100	95-100	85-100	8-28	<25	NP-5
	43-80	Sandy clay loam	SC	A-2, A-4, A-6	0	90-100	90-100	90-100	25-50	22-36	8-20
Heaton----------	0-24	Fine sand--------	SM	A-2-4	0	95-100	95-100	70-90	15-30	<25	NP-3
	24-77	Sandy clay loam	SC, CL	A-4, A-6	0	98-100	95-100	75-95	36-65	20-35	8-22
Po. Pits											
PrB-------------- Ponder	0-7	Clay loam--------	CL	A-6	0	95-100	95-100	90-100	50-85	30-38	15-22
	7-54	Clay, clay loam	CH, CL	A-7	0	95-100	95-100	95-100	75-95	43-65	25-45
	54-80	Silty clay loam, silt loam, clay loam.	CH, CL	A-7, A-6	0	95-100	95-100	95-100	75-95	35-58	20-42
Ps--------------- Pulexas	0-7	Very fine sandy loam.	ML, CL-ML, CL	A-4	0	100	95-100	85-100	55-84	<30	NP-10
	7-72	Fine sandy loam, very fine sandy loam, loam.	SM, SC, ML, CL	A-4	0	100	95-100	90-100	45-74	<30	NP-10
Pu--------------- Pulexas	0-8	Very fine sandy loam, fine sandy loam, loam, loamy fine sand, clay loam.	SM, SM-SC, ML, CL-ML	A-4	0	100	95-100	70-100	36-65	<30	NP-7
	8-70	Fine sandy loam, very fine sandy loam, loam.	SM, SC, ML, CL	A-4	0	100	95-100	90-100	45-74	<30	NP-10

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
PvB-------------- Purves	0-12	Clay, silty clay loam, silty clay	CH	A-7-6, A-7-5	0-5	90-100	80-100	80-98	70-95	51-71	25-40
	12-15	Gravelly clay, very gravelly clay, gravelly clay loam.	CH, SC, GC	A-7-6	0-35	60-100	60-100	55-95	45-90	51-65	30-40
	15-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
SaB-------------- Sanger	0-8	Clay-------------	CH, CL	A-7-6	0	95-100	95-100	90-100	80-95	40-60	28-42
	8-21	Clay, silty clay	CH, CL	A-7-6	0	95-100	94-100	90-100	80-100	40-60	28-42
	21-38	Clay, silty clay	CH, CL	A-7-6	0	95-100	94-100	90-100	85-100	40-60	20-36
	38-70	Clay, silty clay, shaly clay.	CH, CL	A-7-6, A-6	0	95-100	94-100	85-100	75-100	39-55	20-35
SaC-------------- Sanger	0-10	Clay-------------	CH, CL	A-7-6	0	95-100	95-100	90-100	80-95	40-60	28-42
	10-24	Clay, silty clay	CH, CL	A-7-6	0	95-100	94-100	90-100	80-100	40-60	28-42
	24-52	Clay, silty clay	CH, CL	A-7-6	0	95-100	94-100	90-100	85-100	40-60	20-36
	52-70	Clay, silty clay, shaly clay.	CH, CL	A-7-6, A-6	0	95-100	94-100	85-100	75-100	39-55	20-35
SaD-------------- Sanger	0-10	Clay-------------	CH, CL	A-7-6	0	95-100	95-100	90-100	80-95	40-60	28-42
	10-29	Clay, silty clay	CH, CL	A-7-6	0	95-100	94-100	90-100	80-100	40-60	28-42
	29-50	Clay, silty clay	CH, CL	A-7-6	0	95-100	94-100	90-100	85-100	40-60	20-36
	50-60	Clay, silty clay, shaly clay.	CH, CL	A-7-6, A-6	0	95-100	94-100	85-100	75-100	39-55	20-35
SbB-------------- San Saba	0-11	Clay-------------	CH	A-7-6	0	90-100	85-100	80-100	75-100	55-70	30-45
	11-30	Clay	CH	A-7-6	0	95-100	90-100	80-100	75-100	55-70	30-45
	30-36	Weathered bedrock	---	---	---	---	---	---	---	---	---
SdB-------------- Selden	0-13	Loamy fine sand--	SP-SM, SM, SM-SC	A-2-4, A-3	0	95-100	95-100	90-100	8-28	<25	NP-4
	13-70	Sandy clay loam, clay loam.	SC, CL	A-6, A-2, A-7-6	0	95-100	95-100	85-100	30-65	28-47	12-28
SeE-------------- Set	0-11	Very stony silty clay.	CL, CH	A-7-6	15-40	85-100	85-100	80-100	75-95	41-60	20-35
	11-54	Clay, silty clay, silty clay loam.	CL, CH	A-6, A-7-6	0-5	85-100	85-100	80-100	75-95	36-60	20-35
	54-64	Shaly clay.	CL, CH	A-6, A-7-6	0	85-100	85-100	80-100	75-95	36-60	16-35
SfC-------------- Silawa	0-12	Fine sandy loam--	SM, SM-SC, ML, CL-ML	A-4	0	95-100	95-100	70-100	40-60	<26	NP-7
	12-46	Sandy clay loam, loam, fine sandy loam.	CL, SC	A-4, A-6	0	85-100	85-100	80-100	35-65	25-40	8-18
	46-80	Fine sandy loam, gravelly fine sandy loam, sandy clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6, A-2-4, A-2-6	0-2	70-100	70-100	38-100	18-60	21-34	4-14
SfC3------------- Silawa	0-6	Fine sandy loam--	SM, SM-SC, ML, CL-ML	A-4	0	95-100	95-100	70-100	40-60	<26	NP-7
	6-34	Sandy clay loam, loam, fine sandy loam.	CL, SC	A-4, A-6	0	85-100	85-100	80-100	35-65	25-40	8-18
	34-60	Fine sandy loam, gravelly fine sandy loam, sandy clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6, A-2-4, A-2-6	0-2	70-100	70-100	38-100	18-60	21-34	4-14

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
ScA-------------- Slidell	0-6	Clay-------------	CH	A-7-6	0	95-100	95-100	95-100	85-100	50-67	31-46
	6-36	Silty clay, clay	CH, CL	A-7-6	0	95-100	93-100	85-100	70-98	34-51	18-30
SgB-------------- Slidell	0-9	Clay-------------	CH	A-7-6	0	95-100	95-100	95-100	85-100	50-67	31-46
	9-50	Silty clay, clay	CH, CL	A-7-6	0	95-100	93-100	85-100	70-98	34-51	18-30
SoC: Somervell-------	0-10	Very gravelly loam.	GC, SC	A-6, A-2-6	0-35	45-75	30-60	25-55	15-45	25-40	11-25
	10-37	Very gravelly clay loam, very gravelly loam.	GC, SC	A-6, A-2-6	0-35	45-75	30-60	25-55	15-45	25-40	11-25
	37-45	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Aledo------------	0-4	Gravelly loam----	CL, GC, SC	A-4, A-6, A-7	0-20	65-95	60-90	55-90	40-70	27-42	8-22
	4-18	Very gravelly clay loam, very gravelly loam.	GC, SC	A-2-4, A-2-6	5-25	35-65	30-50	25-50	15-35	27-40	8-20
	18-24	Weathered bedrock	---	---	---	---	---	---	---	---	---
SpB-------------- Speck	0-4	Clay loam--------	CL, CH	A-6, A-7-6	0	90-100	90-100	80-100	70-90	30-54	13-30
	4-16	Clay	CL, CH	A-7-6	0	95-100	90-100	80-100	75-95	45-65	25-40
	16-24	Indurated, unweathered bedrock.	---	---	---	---	---	---	---	---	---
ThB-------------- Thurber	0-6	Clay loam--------	CL	A-4, A-6	0	95-100	95-100	90-100	60-90	25-40	8-20
	6-42	Clay, clay loam	CL, CH	A-7-6, A-6	0	95-100	95-100	90-100	70-95	37-65	22-45
	42-62	Clay, clay loam	CL	A-6, A-7-6	0	95-100	85-100	75-100	50-85	35-50	20-35
Tr--------------- Trinity	0-6	Clay-------------	CH	A-7-6	0	100	98-100	85-100	80-100	55-85	35-60
	6-80	Clay-------------	CH	A-7-6	0	100	95-100	85-100	80-100	55-85	35-60
TuB-------------- Truce	0-6	Fine sandy loam--	CL-ML, SM-SC, SM, SC	A-4	0	95-100	90-100	70-100	40-75	20-30	3-10
	6-44	Clay, clay loam	CL, CH	A-6, A-7	0	90-100	90-100	80-100	60-85	35-52	20-34
	44-50	Very shaly clay, shaly clay.	CL, CH	A-6, A-7	0	90-100	90-100	80-100	60-95	35-52	20-34
TuC-------------- Truce	0-7	Fine sandy loam--	CL-ML, SM-SC, SM, SC	A-4	0	95-100	90-100	70-100	40-75	20-30	3-10
	7-44	Clay, clay loam	CL, CH	A-6, A-7	0	90-100	90-100	80-100	60-85	35-52	20-34
	44-80	Very shaly clay, shaly clay.	CL, CH	A-6, A-7	0	90-100	90-100	80-100	60-95	35-52	20-34
TuC3------------- Truce	0-3	Fine sandy loam--	CL-ML, SM-SC, SM, SC	A-4	0	95-100	90-100	70-100	40-75	20-30	3-10
	3-54	Clay, clay loam	CL, CH	A-6, A-7	0	90-100	90-100	80-100	60-85	35-52	20-34
	54-70	Very shaly clay, shaly clay.	CL, CH	A-6, A-7	0	90-100	90-100	80-100	60-95	35-52	20-34

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
VeB--------------- Venus	0-17	Loam-------------	CL, CL-ML	A-4, A-6	0	100	95-100	85-100	50-80	20-40	5-22
	17-69	Loam, clay loam, sandy clay loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	50-80	20-40	5-24
	69-80	Fine sandy loam, loam, sandy clay loam, clay loam.	SC, SM-SC, CL, CL-ML	A-4, A-6	0	80-100	70-100	65-100	44-73	20-40	5-20
VeC--------------- Venus	0-14	Loam-------------	CL, CL-ML	A-4, A-6	0	100	95-100	85-100	50-80	20-40	5-22
	14-52	Loam, clay loam, sandy clay loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	50-80	20-40	5-24
	52-70	Fine sandy loam, loam, sandy clay loam, clay loam.	SC, SM-SC, CL, CL-ML	A-4, A-6	0	80-100	70-100	65-100	44-73	20-40	5-20
VrC--------------- Vernon	0-4	Clay-------------	CL, CH	A-6, A-7-6	0	95-100	90-100	90-100	80-98	38-60	20-38
	4-32	Clay	CL, CH	A-6, A-7-6	0	95-100	90-100	90-100	80-98	38-60	20-38
	32-60	Shaly clay, clay	CL, CH	A-6, A-7-6	0-5	90-100	85-100	65-100	65-96	30-60	15-38
WeC: Weatherford-----	0-11	Very fine sandy loam.	ML, CL, CL-ML, SM-SC	A-4	0	95-100	95-100	90-100	40-69	<30	NP-10
	11-25	Sandy clay loam	SC, CL	A-6	0	95-100	95-100	80-100	36-65	30-40	15-24
	25-47	Sandy clay loam, fine sandy loam.	SC, CL	A-4, A-6	0	95-100	95-100	80-100	36-65	20-40	8-20
	47-80	Fine sandy loam, very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4, A-2-4	0	95-100	95-100	80-100	30-60	<28	NP-7
Duffau----------	0-16	Very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	0	95-100	95-100	80-100	36-65	<28	NP-7
	16-80	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0	95-100	95-100	80-100	36-65	30-40	15-24
WeC3: Weatherford-----	0-8	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4, A-2-4	0	95-100	95-100	75-90	30-60	<25	NP-7
	8-20	Sandy clay loam	SC, CL	A-6	0	95-100	95-100	80-100	36-65	30-40	15-24
	20-41	Sandy clay loam, fine sandy loam.	SC, CL	A-4, A-6	0	95-100	95-100	80-100	36-65	20-40	8-20
	41-60	Fine sandy loam, very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4, A-2-4	0	95-100	95-100	80-100	30-60	<28	NP-7
Duffau----------	0-10	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4, A-2-4	0	95-100	95-100	75-100	30-60	<25	NP-7
	10-64	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0	95-100	95-100	80-100	36-65	30-40	15-24
	64-80	Weathered bedrock	---	---	---	---	---	---	---	---	---
Wf--------------- Westfork	0-8	Silty clay-------	CL, CH	A-7-6	0	100	100	98-100	95-100	41-55	24-35
	8-43	Silty clay	CL, CH	A-7-6	0	100	100	98-100	95-100	41-55	24-35
	43-80	Silty clay loam, silty clay.	CL, CH	A-7-6	0	100	100	95-100	90-100	41-55	24-35

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TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
WtC-------------- Windthorst	0-10	Fine sandy loam	SM, SM-SC, CL-ML, ML	A-4	0	100	95-100	75-100	36-65	<28	NP-7
	10-34	Clay, sandy clay, clay loam.	CL, CH	A-6, A-7-6	0	95-100	95-100	85-100	60-89	35-53	20-35
	34-45	Sandy clay loam, sandy clay, clay loam.	CL	A-4, A-6, A-7-6	0	95-100	90-100	75-100	55-84	25-45	8-28
	45-60	Sandy clay loam, fine sandy loam, shaly clay, clay loam.	SC, CL	A-4, A-6, A-7-6	0	90-100	90-100	75-100	45-75	25-45	8-28
WtC3------------- Windthorst	0-4	Fine sandy loam	SM, SM-SC, CL-ML, ML	A-4	0	100	95-100	75-100	36-65	<28	NP-7
	4-43	Clay, sandy clay, clay loam.	CL, CH	A-6, A-7-6	0	95-100	95-100	85-100	60-89	35-53	20-35
	43-62	Sandy clay loam, fine sandy loam, shaly clay, clay loam.	SC, CL	A-4, A-6, A-7-6	0	90-100	90-100	75-100	45-75	25-45	8-28
WzC-------------- Wise	0-7	Clay loam--------	CL, CL-ML	A-6, A-4	0	95-100	95-100	85-100	75-95	17-40	5-22
	7-27	Clay loam, loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	95-100	95-100	85-100	75-95	17-40	5-22
	27-60	Stratified very fine sandy loam to shaly silty clay loam.	CL, CL-ML, SC, SM-SC	A-6, A-4	0	95-100	95-100	85-100	49-85	17-40	5-22

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cc	In/hr	In/in	pH					Pct
ArC	0-13	15-26	1.35-1.60	2.0-6.0	0.12-0.18	6.1-7.3	Low	0.32	5	6	1-3
Anocon	13-56	35-45	1.35-1.70	0.2-0.6	0.14-0.18	6.1-7.8	Moderate	0.32			
	56-70	25-40	1.30-1.70	0.2-0.6	0.12-0.18	6.6-8.4	Moderate	0.32			
Ar.											
Arents											
Ba	0-6	12-25	1.25-1.45	0.6-2.0	0.12-0.18	6.1-7.8	Low	0.37	5	6	<2
Balsora	6-62	18-35	1.35-1.60	0.6-2.0	0.12-0.18	6.1-8.4	Low	0.37			
Bb	0-6	12-25	1.25-1.45	0.6-2.0	0.12-0.18	6.1-7.8	Low	0.37	5	6	<2
Balsora	6-52	18-35	1.35-1.60	0.6-2.0	0.12-0.18	6.1-8.4	Low	0.37			
	52-64	27-45	1.40-1.60	0.2-0.6	0.13-0.19	6.1-8.4	Moderate	0.32			
Bc	0-9	40-45	1.30-1.50	0.2-0.6	0.13-0.19	6.1-7.8	Moderate	0.32	5	6	<2
Balsora	9-44	18-35	1.35-1.60	0.6-2.0	0.12-0.18	6.1-8.4	Low	0.37			
	44-60	27-45	1.40-1.60	0.2-0.6	0.13-0.19	6.1-8.4	Moderate	0.32			
BdB	0-17	5-12	1.55-1.65	2.0-6.0	0.07-0.11	5.1-7.3	Very low	0.20	5	2	<1
Bastsil	17-65	20-35	1.50-1.65	0.6-2.0	0.12-0.16	5.6-7.8	Moderate	0.32			
BfB	0-15	7-20	1.50-1.65	2.0-6.0	0.11-0.15	5.1-7.3	Low	0.24	5	3	<2
Bastsil	15-80	20-35	1.50-1.65	0.6-2.0	0.12-0.16	5.6-7.8	Moderate	0.32			
BkB	0-18	15-30	1.30-1.50	0.6-2.0	0.15-0.20	6.1-7.8	Moderate	0.32	5	6	1-3
Blanket	18-41	35-50	1.35-1.55	0.2-0.6	0.12-0.18	6.1-8.4	Moderate	0.43			
	41-80	35-40	1.35-1.55	0.6-2.0	0.12-0.18	7.9-8.4	Moderate	0.43			
BoB	0-12	20-40	1.20-1.50	0.06-2.0	0.11-0.18	7.9-8.4	Moderate	0.32	2	4L	1-3
Bolar	12-32	20-40	1.20-1.50	0.06-2.0	0.11-0.18	7.9-8.4	Moderate	0.32			
	32-47	---	---	---	---	---	---	---			
BoC	0-12	20-40	1.20-1.50	0.06-2.0	0.11-0.18	7.9-8.4	Moderate	0.32	2	4L	1-3
Bolar	12-34	20-40	1.20-1.50	0.06-2.0	0.11-0.18	7.9-8.4	Moderate	0.32			
	34-60	---	---	---	---	---	---	---			
BtC	0-8	10-20	1.35-1.55	0.6-2.0	0.11-0.15	5.6-7.3	Low	0.37	2	3	<2
Bonti	8-26	35-50	1.35-1.60	0.2-0.6	0.15-0.20	5.1-6.0	Moderate	0.32			
	26-36	---	---	---	---	---	---	---			
BxC:											
Bonti	0-11	7-20	---	0.6-2.0	0.08-0.12	5.6-7.3	Low	0.28	2	8	.5-1
	11-30	35-50	---	0.2-0.6	0.15-0.20	5.1-6.0	Moderate	0.32			
	30-34	---	---	---	---	---	---	---			
Exray	0-6	7-22	1.40-1.60	0.6-2.0	0.08-0.14	6.1-7.3	Low	0.20	1	8	.5-1
	6-16	35-50	1.40-1.60	0.2-0.6	0.12-0.20	5.6-6.5	Moderate	0.32			
	16-40	---	---	---	---	---	---	---			
ByE:											
Brackett	0-6	10-35	1.30-1.50	0.6-2.0	0.08-0.12	7.9-8.4	Low	0.17	2	8	1-3
	6-18	18-35	1.30-1.55	0.6-2.0	0.11-0.16	7.9-8.4	Low	0.32			
	18-40	18-45	1.35-1.65	0.2-0.6	0.10-0.15	7.9-8.4	Low	0.32			
Aledo	0-6	20-35	1.20-1.50	0.6-2.0	0.07-0.18	7.9-8.4	Moderate	0.10	1	8	1-3
	6-13	20-35	1.20-1.50	0.6-2.0	0.05-0.12	7.9-8.4	Low	0.10			
	13-20	---	---	---	---	---	---	---			

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cc	In/hr	In/in	pH					Pct
ChB	0-12	5-15	1.78-1.87	2.0-6.0	0.05-0.10	5.6-7.3	Very low	0.20	5	2	.5-1
Chaney	12-40	35-50	1.42-1.72	0.06-0.2	0.15-0.18	5.6-7.3	Moderate	0.28			
	40-46	20-45	1.54-1.82	0.06-0.2	0.15-0.18	5.6-8.0	Moderate	0.28			
	46-72	20-45	1.68-1.89	0.06-0.2	0.15-0.18	5.6-8.0	Moderate	0.28			
CoB	0-13	5-15	1.35-1.50	2.0-6.0	0.07-0.11	6.1-7.3	Very low	0.20	5	2	<1
Cisco	13-40	20-35	1.40-1.65	0.6-2.0	0.11-0.16	6.1-7.8	Moderate	0.32			
	40-60	15-30	1.50-1.65	2.0-6.0	0.10-0.15	7.4-8.4	Low	0.32			
CsE	0-9	5-15	1.30-1.55	2.0-6.0	0.12-0.15	6.1-7.8	Low	0.17	5	8	<2
Cona	9-32	35-45	1.35-1.65	0.2-0.6	0.14-0.18	5.1-6.5	High	0.32			
	32-60	35-50	1.40-1.70	0.06-0.2	0.06-0.15	5.6-7.8	High	0.32			
DaE:											
Darnell	0-3	10-20	1.30-1.65	2.0-6.0	0.12-0.16	5.1-7.3	Low	0.10	2	8	<1
	3-11	10-20	1.40-1.70	2.0-6.0	0.12-0.16	5.1-7.3	Low	0.32			
	11-14	---	---	---	---	---	---	---			
Exray	0-7	7-20	1.40-1.60	0.6-2.0	0.07-0.12	6.1-7.3	Low	0.15	1	8	.5-1
	7-16	35-50	1.40-1.60	0.2-0.6	0.12-0.20	5.6-6.5	Moderate	0.32			
	16-20	---	---	---	---	---	---	---			
De	0-6	40-55	1.35-1.55	0.06-0.2	0.14-0.18	6.6-8.4	High	0.32	5	4	1-3
Deleon	6-75	40-55	1.35-1.55	0.06-0.2	0.14-0.18	6.6-8.4	High	0.32			
	75-80	27-45	1.25-1.50	0.06-0.2	0.14-0.22	7.9-8.4	High	0.32			
DfC	0-17	3-12	1.25-1.50	2.0-6.0	0.07-0.11	6.1-7.8	Very low	0.17	5	2	<1
Duffau	17-80	20-35	1.35-1.60	0.6-2.0	0.12-0.19	5.6-7.3	Low	0.37			
DuB	0-12	5-18	1.30-1.50	2.0-6.0	0.11-0.15	6.1-7.8	Low	0.37	5	3	<1
Duffau	12-61	20-35	1.35-1.60	0.6-2.0	0.12-0.19	5.6-7.3	Low	0.37			
	61-69	15-35	1.45-1.65	0.6-2.0	0.10-0.15	6.1-7.8	Low	0.43			
	69-80	---	---	---	---	---	---	---			
DvC4:											
Duffau	0-8	5-18	1.30-1.50	2.0-6.0	0.12-0.17	6.1-7.8	Low	0.49	5	3	<1
	8-80	20-35	1.35-1.60	0.6-2.0	0.12-0.19	5.6-7.3	Low	0.37			
Gullied land.											
Fr	0-10	30-50	1.30-1.55	0.2-0.6	0.11-0.17	7.9-8.4	Moderate	0.32	5	4	1-4
Frio	10-80	35-42	1.40-1.60	0.2-0.6	0.11-0.15	7.9-8.4	Moderate	0.32			
HaB	0-11	10-20	1.50-1.65	0.6-2.0	0.11-0.20	6.1-7.3	Low	0.43	5	5	<2
Hassee	11-48	45-60	1.55-1.70	<0.06	0.12-0.18	6.1-8.4	High	0.32			
	48-80	35-60	1.55-1.70	<0.06	0.12-0.20	6.6-8.4	High	0.32			
HeB	0-4	15-30	1.35-1.55	0.2-0.6	0.08-0.16	6.1-7.8	Low	0.15	1	8	<2
Hensley	4-18	35-55	1.40-1.65	0.06-0.2	0.10-0.20	6.6-8.4	Moderate	0.43			
	18-22	---	---	---	---	---	---	---			
KtC	0-7	4-15	1.40-1.60	0.6-2.0	0.12-0.17	6.1-7.3	Low	0.43	5	3	<2
Keeter	7-15	27-40	1.40-1.60	0.2-0.6	0.11-0.16	5.1-6.5	Moderate	0.32			
	15-33	15-35	1.45-1.65	0.2-0.6	0.11-0.16	5.1-7.3	Moderate	0.32			
	33-72	4-18	1.45-1.65	0.6-2.0	0.10-0.15	6.6-8.4	Low	0.43			
KtC3	0-3	4-15	1.40-1.60	0.6-2.0	0.12-0.17	6.1-7.3	Low	0.43	5	3	<2
Keeter	3-18	27-40	1.40-1.60	0.2-0.6	0.11-0.16	5.1-6.5	Moderate	0.32			
	18-38	15-35	1.45-1.65	0.2-0.6	0.11-0.16	5.1-7.3	Moderate	0.32			
	38-72	4-18	1.45-1.65	0.6-2.0	0.10-0.15	6.6-8.4	Low	0.43			

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cc	In/hr	In/in	pH					Pct
LnB	0-6	20-35	1.35-1.60	0.6-2.0	0.12-0.20	6.1-7.8	Low	0.32	2	4	.5-2
Lindy	6-24	35-45	1.35-1.60	0.06-0.2	0.10-0.20	6.1-7.8	Moderate	0.32			
	24-40	---	---	---	---	---	---	---			
MaB	0-14	8-18	1.35-1.60	2.0-6.0	0.11-0.15	6.1-7.8	Low	0.37	5	3	<1
May	14-42	20-35	1.40-1.65	0.6-2.0	0.12-0.20	6.6-7.8	Moderate	0.32			
	42-64	10-30	1.40-1.70	0.6-2.0	0.11-0.20	7.4-8.4	Moderate	0.32			
MdE:											
Medlin	0-7	40-60	1.30-1.55	<0.06	0.10-0.18	7.4-8.4	High	0.20	5	8	1-3
	7-44	40-60	1.35-1.60	<0.06	0.12-0.18	7.4-8.4	High	0.32			
	44-60	40-60	1.35-1.65	<0.06	0.12-0.18	7.4-8.4	High	0.32			
Sanger	0-16	40-60	1.40-1.55	<0.06	0.10-0.18	7.4-8.4	High	0.20	5	4	1-3
	16-44	40-60	1.40-1.55	<0.06	0.12-0.18	7.9-8.4	High	0.32			
	44-62	40-60	1.50-1.70	<0.06	0.12-0.18	7.9-8.4	High	0.32			
MoB	0-7	27-40	1.30-1.50	0.6-2.0	0.12-0.18	6.6-8.4	Moderate	0.32	2	6	1-3
Mingo	7-33	35-55	1.35-1.60	<0.06	0.10-0.20	6.6-8.4	High	0.32			
	33-44	---	---	---	---	---	---	---			
NdB	0-24	1-5	1.20-1.40	6.0-20	0.05-0.10	5.6-7.3	Very low	0.17	5	1	<1
Nimrod	24-62	20-35	1.30-1.65	0.2-0.6	0.12-0.17	5.1-6.0	Low	0.24			
	62-80	10-30	1.40-1.70	0.2-0.6	0.06-0.17	5.1-6.5	Low	0.24			
OwE	0-7	35-60	1.35-1.55	<0.06	0.10-0.17	7.9-8.4	High	0.10	1	8	.5-2
Owens	7-18	35-60	1.45-1.65	<0.06	0.13-0.17	7.9-8.4	High	0.32			
	18-40	35-60	1.60-1.75	<0.06	0.03-0.08	7.9-8.4	High	0.37			
PaC	0-4	18-35	1.30-1.55	0.6-2.0	0.10-0.15	6.1-8.4	Moderate	0.05	1	8	1-3
Palopinto	4-15	18-35	1.35-1.60	0.6-2.0	0.10-0.15	6.1-8.4	Moderate	0.05			
	15-20	---	---	---	---	---	---	---			
PhC:											
Patilo	0-43	2-15	1.50-1.65	6.0-20	0.05-0.08	5.6-7.3	Very low	0.17	5	1	<1
	43-80	20-35	1.50-1.65	0.2-0.6	0.14-0.18	5.1-6.5	Low	0.24			
Heaton	0-24	1-5	1.20-1.40	2.0-6.0	0.05-0.10	5.6-7.3	Very low	0.17	5	1	<1
	24-77	20-35	1.30-1.65	0.6-2.0	0.14-0.16	5.6-7.3	Low	0.24			
Po.											
Pits											
PrB	0-7	22-35	1.40-1.60	0.2-0.6	0.15-0.20	5.6-7.3	Moderate	0.37	5	6	1-3
Ponder	7-54	35-50	1.45-1.60	0.06-0.2	0.12-0.18	5.6-8.4	High	0.32			
	54-80	25-40	1.50-1.70	0.2-0.6	0.15-0.20	7.9-8.4	High	0.32			
Ps	0-7	7-18	1.35-1.60	2.0-6.0	0.12-0.18	6.1-8.4	Low	0.32	5	3	<2
Pulexas	7-72	8-18	1.30-1.50	2.0-6.0	0.11-0.15	5.6-8.4	Low	0.28			
Pu	0-8	7-18	1.30-1.55	2.0-6.0	0.11-0.15	6.1-8.4	Low	0.28	5	3	<2
Pulexas	8-70	8-18	1.30-1.50	2.0-6.0	0.11-0.15	5.6-8.4	Low	0.28			
PvB	0-12	35-55	1.35-1.55	0.2-0.6	0.12-0.18	7.9-8.4	High	0.32	1	4	1-3
Purves	12-15	35-55	1.35-1.55	0.2-0.6	0.08-0.18	7.9-8.4	High	0.32			
	15-20	---	---	---	---	---	---	---			
SaB	0-8	40-60	1.40-1.55	<0.06	0.12-0.18	7.4-8.4	High	0.32	5	4	1-3
Sanger	8-21	40-60	1.40-1.55	<0.06	0.12-0.18	7.4-8.4	High	0.32			
	21-38	40-60	1.40-1.55	<0.06	0.12-0.18	7.9-8.4	High	0.32			
	38-70	40-60	1.50-1.70	<0.06	0.12-0.18	7.9-8.4	High	0.32			

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cc	In/hr	In/in	pH					Pct
SaC	0-10	40-60	1.40-1.55	<0.06	0.12-0.18	7.4-8.4	High	0.32	5	4	1-3
Sanger	10-24	40-60	1.40-1.55	<0.06	0.12-0.18	7.4-8.4	High	0.32			
	24-52	40-60	1.40-1.55	<0.06	0.12-0.18	7.9-8.4	High	0.32			
	52-70	40-60	1.50-1.70	<0.06	0.12-0.18	7.9-8.4	High	0.32			
SaD	0-10	40-60	1.40-1.55	<0.06	0.12-0.18	7.4-8.4	High	0.32	5	4	1-3
Sanger	10-29	40-60	1.40-1.55	<0.06	0.12-0.18	7.4-8.4	High	0.32			
	29-50	40-60	1.40-1.55	<0.06	0.12-0.18	7.9-8.4	High	0.32			
	50-60	40-60	1.50-1.70	<0.06	0.12-0.18	7.9-8.4	High	0.32			
SbB	0-11	45-60	1.40-1.60	<0.06	0.15-0.20	7.4-8.4	High	0.32	2	4	1-4
San Saba	11-30	45-60	1.40-1.65	<0.06	0.15-0.20	7.4-8.4	High	0.32			
	30-36	---	---	---	---	---	-------------	----			
SdB	0-13	3-15	1.25-1.43	2.0-6.0	0.05-0.09	5.6-7.3	Very low	0.17	5	2	<1
Selden	13-70	20-35	1.35-1.65	0.2-0.6	0.12-0.17	5.1-6.5	Low	0.24			
SeE	0-11	40-55	1.40-1.50	0.06-0.2	0.12-0.18	7.9-8.4	Moderate	0.15	4	8	1-3
Set	11-54	35-55	1.40-1.60	0.06-0.2	0.12-0.20	7.9-8.4	Moderate	0.32			
	54-64	20-55	1.40-1.65	<0.06	0.12-0.18	7.9-8.4	Moderate	0.32			
SfC	0-12	10-20	1.35-1.55	2.0-6.0	0.10-0.15	5.1-6.5	Low	0.24	5	3	.5-2
Silawa	12-46	18-35	1.35-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low	0.32			
	46-80	12-30	1.40-1.65	2.0-6.0	0.08-0.15	4.5-6.0	Low	0.32			
SfC3	0-6	10-20	1.35-1.55	2.0-6.0	0.10-0.15	5.1-6.5	Low	0.24	5	3	.5-2
Silawa	6-34	18-35	1.35-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low	0.32			
	34-60	12-30	1.40-1.65	2.0-6.0	0.08-0.15	4.5-6.0	Low	0.32			
SgA	0-6	40-60	1.35-1.55	<0.06	0.15-0.20	7.4-8.4	High	0.32	5	4	1-4
Slidell	6-80	40-60	1.40-1.60	<0.06	0.15-0.20	7.4-8.4	High	0.32			
SgB	0-9	40-60	1.35-1.55	<0.06	0.15-0.20	7.4-8.4	High	0.32	5	4	1-4
Slidell	9-80	40-60	1.40-1.60	<0.06	0.15-0.20	7.4-8.4	High	0.32			
SoC:											
Somervell	0-10	20-40	1.30-1.60	0.6-2.0	0.03-0.16	7.9-8.4	Low	0.10	2	8	1-3
	10-37	20-40	1.45-1.60	0.6-2.0	0.03-0.13	7.9-8.4	Low	0.10			
	37-45	---	---	---	---	---	-------------	----			
Aledo	0-4	20-35	1.20-1.50	0.6-2.0	0.07-0.18	7.9-8.4	Moderate	0.10	1	8	1-3
	4-18	20-35	1.20-1.50	0.6-2.0	0.05-0.12	7.9-8.4	Low	0.10			
	18-24	---	---	---	---	---	-------------	----			
SpB	0-4	20-39	1.35-1.55	0.2-0.6	0.15-0.20	6.1-7.8	Moderate	0.32	1	6	1-3
Speck	4-16	40-60	1.35-1.50	0.06-0.2	0.12-0.18	6.1-7.8	High	0.32			
	16-24	---	---	---	---	---	-------------	----			
ThB	0-6	20-35	1.40-1.65	0.2-0.6	0.15-0.22	6.1-7.8	Moderate	0.43	5	4	<2
Thurber	6-42	35-55	1.40-1.65	<0.06	0.12-0.18	6.6-8.4	High	0.32			
	42-62	27-40	1.40-1.70	<0.06	0.12-0.18	7.4-8.4	High	0.32			
Tr	0-6	60-75	1.35-1.55	<0.06	0.15-0.20	7.4-8.4	Very high	0.32	5	4	1-4
Trinity	6-80	60-75	1.40-1.60	<0.06	0.15-0.20	7.4-8.4	Very high	0.32			
TuB	0-6	8-20	1.45-1.62	0.6-2.0	0.07-0.12	5.6-7.3	Low	0.37	4	3	<2
Truce	6-44	35-55	1.55-1.69	0.06-0.2	0.07-0.13	6.1-8.4	Moderate	0.32			
	44-50	35-55	1.60-1.80	<0.06	0.05-0.09	6.6-8.4	Moderate	0.28			

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodi-bility group	Organic matter
								K	T		
	In	Pct	G/cc	In/hr	In/in	pH					Pct
TuC	0-7	8-20	1.45-1.62	0.6-2.0	0.07-0.12	5.6-7.3	Low	0.37	4	3	<2
Truce	7-44	35-55	1.55-1.69	0.06-0.2	0.07-0.13	6.1-8.4	Moderate	0.32			
	44-80	35-55	1.60-1.80	<0.06	0.05-0.09	6.6-8.4	Moderate	0.28			
TuC3	0-3	8-20	1.45-1.62	0.6-2.0	0.07-0.12	5.6-7.3	Low	0.37	4	3	<2
Truce	3-54	35-55	1.55-1.69	0.06-0.2	0.07-0.13	6.1-8.4	Moderate	0.32			
	54-70	35-55	1.60-1.80	<0.06	0.05-0.09	6.6-8.4	Moderate	0.28			
VeB	0-17	18-30	1.20-1.50	0.6-2.0	0.15-0.20	7.9-8.4	Low	0.28	5	4L	1-2
Venus	17-69	18-35	1.20-1.50	0.6-2.0	0.15-0.20	7.9-8.4	Low	0.28			
	69-80	18-35	1.30-1.60	0.6-2.0	0.13-0.18	7.9-8.4	Low	0.28			
VeC	0-14	18-30	1.20-1.50	0.6-2.0	0.15-0.20	7.9-8.4	Low	0.28	5	4L	1-2
Venus	14-52	18-35	1.20-1.50	0.6-2.0	0.15-0.20	7.9-8.4	Low	0.28			
	52-70	18-35	1.30-1.60	0.6-2.0	0.13-0.18	7.9-8.4	Low	0.28			
VrC	0-4	40-60	1.35-1.55	<0.06	0.10-0.17	7.9-8.4	High	0.32	3	4	.5-2
Vernon	4-32	40-60	1.50-1.65	<0.06	0.10-0.15	7.9-8.4	High	0.37			
	32-60	40-60	1.60-1.75	<0.06	0-0.10	7.9-8.4	High	0.37			
WeC:											
Weatherford	0-11	8-20	1.40-1.55	2.0-6.0	0.12-0.18	5.1-7.3	Low	0.49	3	3	<2
	11-25	20-35	1.50-1.65	0.6-2.0	0.12-0.19	5.1-6.0	Low	0.49			
	25-47	18-35	1.50-1.65	0.6-2.0	0.10-0.15	5.1-6.0	Low	0.49			
	47-80	8-20	1.55-1.70	0.6-2.0	0.08-0.12	5.6-7.3	Low	0.49			
Duffau	0-16	5-18	1.30-1.50	2.0-6.0	0.12-0.17	6.1-7.8	Low	0.49	5	3	<1
	16-80	20-35	1.35-1.60	0.6-2.0	0.12-0.19	5.6-7.3	Low	0.37			
WeC3:											
Weatherford	0-8	8-20	1.40-1.55	2.0-6.0	0.11-0.15	5.1-7.3	Low	0.43	3	3	<2
	8-20	20-35	1.50-1.65	0.6-2.0	0.12-0.19	5.1-6.0	Low	0.49			
	20-41	18-35	1.50-1.65	0.6-2.0	0.10-0.15	5.1-6.0	Low	0.49			
	41-60	8-20	1.55-1.70	0.6-2.0	0.08-0.12	5.6-7.3	Low	0.49			
Duffau	0-10	5-18	1.30-1.50	2.0-6.0	0.11-0.15	6.1-7.8	Low	0.37	5	3	<1
	10-64	20-35	1.35-1.60	0.6-2.0	0.12-0.19	5.6-7.3	Low	0.37			
	64-80	15-35	1.45-1.65	0.6-2.0	0.10-0.15	6.1-7.8	Low	0.43			
Wf	0-8	40-60	1.20-1.30	<0.06	0.12-0.18	6.1-7.8	High	0.28	5	4	1-4
Westfork	8-43	40-60	1.25-1.35	<0.06	0.12-0.18	6.1-7.8	High	0.32			
	43-80	35-60	1.30-1.40	<0.06	0.12-0.18	7.9-8.4	High	0.32			
WtC	0-10	5-18	1.45-1.60	0.6-2.0	0.12-0.16	5.6-7.3	Low	0.49	5	3	<1
Windthorst	10-34	35-45	1.45-1.65	0.2-0.6	0.15-0.18	5.6-7.3	Moderate	0.37			
	34-45	15-45	1.50-1.68	0.2-0.6	0.12-0.18	5.6-8.4	Moderate	0.37			
	45-60	15-45	1.50-1.70	0.2-0.6	0.11-0.16	5.6-8.4	Moderate	0.49			
WtC3	0-4	5-18	1.45-1.60	0.6-2.0	0.12-0.16	5.6-7.3	Low	0.49	5	3	<1
Windthorst	4-43	35-45	1.45-1.65	0.2-0.6	0.15-0.18	5.6-7.3	Moderate	0.37			
	43-62	15-45	1.50-1.70	0.2-0.6	0.11-0.16	5.6-8.4	Moderate	0.49			
WzC	0-7	18-30	1.30-1.50	0.6-2.0	0.15-0.18	7.4-8.4	Moderate	0.37	3	6	.5-2
Wise	7-27	20-30	1.35-1.60	0.6-2.0	0.15-0.18	7.4-8.4	Moderate	0.37			
	27-60	10-30	1.35-1.65	0.6-6.0	0.11-0.15	7.4-8.4	Moderate	0.37			

TABLE 16.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "occasional," "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Map symbol and soil name	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
AnC Anocon	C	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
Ar. Arents											
Ba Balsora	B	Occasional	Very brief to brief.	Oct-May	>6.0	---	---	>60	---	Moderate	Low.
Bb, Bc Balsora	B	Frequent	Very brief to long.	Oct-May	>6.0	---	---	>60	---	Moderate	Low.
BdB, BfB Bastsil	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
BkB Blanket	C	None	---	---	>6.0	---	---	>60	---	High	Low.
BoB, BoC Bolar	C	None	---	---	>6.0	---	---	20-40	Soft	High	Low.
BtC Bonti	C	None	---	---	>6.0	---	---	20-40	Hard	High	Moderate.
BxC:											
Bonti	C	None	---	---	>6.0	---	---	20-40	Hard	High	Moderate.
Exray	D	None	---	---	>6.0	---	---	14-20	Hard	High	Moderate.
ByE:											
Brackett	C	None	---	---	>6.0	---	---	>60	---	High	Low.
Aledo	C	None	---	---	>6.0	---	---	6-20	Soft	Moderate	Low.
ChB Chaney	C	None	---	---	>6.0	---	---	>60	---	High	Moderate.
CoB Cisco	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
CsE Cona	C	None	---	---	>6.0	---	---	>60	---	High	Moderate.
DaE:											
Darnell	C	None	---	---	>6.0	---	---	10-20	Soft	Low	Moderate.
Exray	D	None	---	---	>6.0	---	---	14-20	Hard	High	Moderate.
De Deleon	C	Frequent	Very brief to brief.	May-Oct	>6.0	---	---	>60	---	High	Low.
DfC, DuB Duffau	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
DvC4:											
Duffau	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
Gullied land.											

TABLE 16.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Uncoated steel	Concrete
					Ft			In			
Fr---------------- Frio	B	Occasional	Very brief to brief.	Oct-May	>6.0	---	---	>60	---	High-----	Low.
HaB---------------- Hassee	D	None--------	---	---	1.0-2.0	Perched	May-Oct	>60	---	High-----	Low.
HeB---------------- Hensley	D	None--------	---	---	>6.0	---	---	10-20	Hard	High-----	Low.
KtC, KtC3---------- Keeter	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
LnB---------------- Lindy	C	None--------	---	---	>6.0	---	---	20-40	Hard	High-----	Low.
MaB---------------- May	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
MdE:											
Medlin------------	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
Sanger------------	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
MoB---------------- Mingo	C	None--------	---	---	>6.0	---	---	22-34	Hard	High-----	Low.
NdB---------------- Nimrod	C	None--------	---	---	1.5-3.5	Perched	May-Oct	>60	---	High-----	Moderate.
OwE---------------- Owens	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
PaC---------------- Palopinto	D	None--------	---	---	>6.0	---	---	6-20	Hard	High-----	Low.
PhC:											
Patilo------------	B	None--------	---	---	4.0-6.0	Perched	Oct-May	>60	---	High-----	Moderate.
Heaton------------	A	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low.
Po. Pits											
PrB---------------- Ponder	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
Ps----------------- Pulexas	B	Occasional	Very brief to brief.	Oct-May	>6.0	---	---	>60	---	Low------	Low.
Pu----------------- Pulexas	B	Frequent----	Very brief to brief.	Oct-May	>6.0	---	---	>60	---	Low------	Low.
PvB---------------- Purves	D	None--------	---	---	>6.0	---	---	8-20	Hard	High-----	Low.
SaB, SaC, SaD----- Sanger	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
SbB---------------- San Saba	D	None--------	---	---	>6.0	---	---	24-40	Hard	High-----	Low.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
SdB Selden	C	None	---	---	>6.0	---	---	>60	---	High	Moderate.
SeE Set	C	None	---	---	>6.0	---	---	>60	---	High	Low.
SfC, SfC3 Silawa	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
SgA, SgB Slidell	D	None	---	---	>6.0	---	---	>60	---	High	Low.
SoC:											
Somervell	B	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Low.
Aledo	C	None	---	---	>6.0	---	---	6-20	Soft	Moderate	Low.
SpB Speck	D	None	---	---	>6.0	---	---	14-20	Hard	High	Low.
ThB Thurber	D	None	---	---	>6.0	---	---	>60	---	High	Low.
Tr Trinity	D	Occasional	Very brief to brief.	Feb-May	0-3.0	Apparent	Nov-Feb	>60	---	High	Low.
TuB, TuC, TuC3 Truce	C	None	---	---	>6.0	---	---	>60	---	High	Low.
VeB, VeC Venus	B	None	---	---	>6.0	---	---	>60	---	High	Low.
VrC Vernon	D	None	---	---	>6.0	---	---	>60	---	High	Low.
WeC, WeC3:											
Weatherford	B	None	---	---	>6.0	---	---	>60	---	Low	Moderate.
Duffau	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
Wf Westfork	D	Occasional	Very brief to brief.	Apr-Nov	>6.0	---	---	>60	---	High	Low.
WtC, WtC3 Windthorst	C	None	---	---	>6.0	---	---	>60	---	High	Low.
WzC Wise	C	None	---	---	>6.0	---	---	>60	---	Moderate	Low.

TABLE 17.--ENGINEERING INDEX TEST DATA

[Dashes indicate data were not available. NP means nonplastic]

Soil name, map symbol, report number, horizon, and depth in inches	Classification		Grain-size distribution									Liquid limit 2/	Plasticity index 2/	Particle density	Shrinkage		
	AASHTO	Unified	Percentage passing sieve-- 1/						Percentage smaller than--						Limit	Linear	Ratio
			5/8 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm	.005 mm	.002 mm						
												Pct		G/cc	Pct	Pct	Pct
Anocon loam: AnC 3/ (S82TX-497-004)																	
A -- 0 to 7	A-6 (7)	CL	100	100	100	100	99	71	---	---	---	30	13	2.59	20.0	5.10	1.69
Bt2 -- 18 to 32	A-7-6 (31)	CH	100	100	100	100	99	85	---	---	---	53	33	2.63	17.0	15.80	1.86
BC -- 56 to 70	A-7-6 (28)	CL	100	100	100	99	99	85	---	---	---	48	31	2.69	13.0	15.90	1.98
Balsora silt loam: Bb 3/ (S82TX-497-007)																	
C1 -- 6 to 33	A-6 (10)	CL	100	100	100	100	100	83	---	---	---	31	14	2.61	14.0	8.90	1.84
C2 -- 33 to 52	A-6 (23)	CL	100	100	100	100	100	95	---	---	---	40	21	2.66	16.0	12.00	1.91
Bastsil fine sandy loam: BfB 4/ (S82TX-497-005)																	
A -- 0 to 9	A-4 (0)	SM	100	100	100	99	96	39	27	6	3	20	3	2.62	17.0	1.80	1.77
Bt1 -- 16 to 45	A-6 (3)	CL	100	100	100	99	96	54	38	23	22	27	11	2.67	16.0	6.10	1.86
Bt2 -- 45 to 65	A-6 (3)	SC	100	100	100	99	97	49	38	23	22	29	12	2.67	17.0	6.60	1.86
Blanket clay loam: BkB 3/ (S82TX-497-006)																	
Ap -- 0 to 8	A-7-6 (38)	CH	100	100	100	100	100	91	---	---	---	62	36	2.62	12.0	20.80	2.01
A -- 8 to 18	A-7-6 (28)	CH	100	100	100	100	100	87	---	---	---	52	29	2.61	15.0	16.20	1.90
Bk -- 41 to 62	A-7-6 (22)	CL	100	100	100	100	100	74	---	---	---	46	26	2.69	14.0	14.80	1.97
Bolar clay loam: BoB 3/ (S80TX-497-005)																	
Ap -- 0 to 7	A-7-6 (24)	CH	100	100	99	98	95	83	---	---	---	52	26	2.66	14.0	17.40	2.05
Bk1 -- 12 to 25	A-7-6 (16)	CL	100	100	94	86	79	67	---	---	---	47	24	2.66	16.0	14.10	1.89
Bk2 -- 25 to 32	A-7-6 (24)	CL	100	100	100	98	96	85	---	---	---	46	26	2.71	16.0	14.10	1.92
Cisco loamy sand: CoB 3/ (S81TX-497-003)																	
Ap -- 0 to 8	A-2-4 (0)	SM	100	100	100	99	85	14	---	---	---	20	3	2.64	14.0	1.50	1.93
Bt1 -- 13 to 28	A-6 (2)	SC	100	100	100	99	90	40	---	---	---	29	15	2.64	16.0	7.10	1.87
C -- 48 to 68	A-2-4 (0)	SM	100	100	99	94	81	25	---	---	---	17	3	2.65	15.0	1.20	1.88

See footnotes at end of table.

TABLE 17.--ENGINEERING INDEX TEST DATA--Continued

Soil name, map symbol, report number, horizon, and depth in inches	Classification		Grain-size distribution									Liquid limit 2/	Plasticity index 2/	Particle density	Shrinkage		
	AASHTO	Unified	Percentage passing sieve-- 1/						Percentage smaller than--						Limit	Linear	Ratio
			5/8 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm	.005 mm	.002 mm						
												Pct		G/cc	Pct	Pct	Pct
Cona very stony sandy loam: CsE 3/ (S81TX-497-001)																	
A -- 0 to 5	A-4 (2)	SC	100	99	95	83	67	37	27	9	5	23	8	2.66	22.0	0.75	1.70
Bt1 -- 9 to 22	A-7-6 (28)	CH	100	100	99	96	90	76	70	54	47	62	34	2.70	15.0	19.30	1.92
BC -- 32 to 39	A-7-6 (39)	CH	100	100	99	97	92	83	74	46	33	65	43	2.71	14.0	21.20	2.01
Darnell very stony fine sandy loam: DeE 3/ (S81TX-497-004)																	
Bw -- 3 to 11	A-2-4 (0)	SM-SC	100	100	100	100	99	27	---	---	---	24	4	2.63	21.0	1.80	1.66
Deleon silty clay: De 3/ (S81TX-407-002)																	
A1 -- 6 to 30	A-7-6 (34)	CH	100	100	100	100	100	95	---	---	---	53	31	2.67	15.0	16.80	1.93
A2 -- 30 to 48	A-7-6 (43)	CH	100	100	100	100	100	98	---	---	---	59	37	2.73	16.0	18.20	1.91
Duffau fine sandy loam: DuB 3/ (S81TX-497-003)																	
Ap -- 0 to 8	A-4 (0)	SM-SC	100	100	100	100	100	44	27	11	8	22	5	2.59	19.0	2.00	1.71
Bt1 -- 8 to 36	A-6 (6)	CL	100	100	100	100	100	56	47	26	23	31	15	2.65	17.0	7.30	1.84
Bt2 -- 36 to 48	A-6 (4)	CL	100	100	100	100	100	62	43	26	23	36	18	2.63	18.0	8.90	1.82
Hassee fine sandy loam: HaB 3/ (S82TX-497-002)																	
Ap -- 0 to 9	A-4 (5)	CL	100	100	100	100	98	67	---	---	---	26	10	2.61	18.0	4.80	1.84
Btg1 -- 11 to 26	A-7-6 (35)	CH	100	100	100	100	99	80	---	---	---	62	41	2.66	13.0	20.50	2.02
Btk -- 34 to 48	A-7-6 (22)	CL	100	100	100	98	96	71	---	---	---	48	32	2.66	12.0	16.50	2.05
Hensley very stony loam: HeB 3/ (S78TX-497-002)																	
A -- 0 to 4	A-6 (15)	CL	100	100	100	99	99	89	68	24	18	40	15	2.59	25.0	7.20	1.64
Bt2 -- 10 to 18	A-7-6 (27)	CL	100	100	100	100	100	89	78	46	38	47	27	2.65	17.0	14.00	1.89

See footnotes at end of table.

TABLE 17.--ENGINEERING INDEX TEST DATA--Continued

Soil name, map symbol, report number, horizon, and depth in inches	Classification		Grain-size distribution									Liquid limit 2/	Plasticity index 2/	Particle density	Shrinkage		
	AASHTO	Unified	Percentage passing sieve-- 1/						Percentage smaller than--						Limit	Linear	Ratio
			5/8 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm	.005 mm	.002 mm						
												Pct		G/cc	Pct	Pct	Pct
Keeter very fine sandy loam: KtC 3/ (S82TX-497-009)																	
A -- 0 to 4	A-4 (0)	ML	100	100	100	100	100	62	33	6	5	23	2	2.61	20.0	1.50	1.66
Bt1 -- 7 to 15	A-7-6 (25)	CL	100	100	100	100	100	91	73	40	38	45	25	2.63	19.0	11.90	1.79
Bt2 -- 15 to 23	A-7-6 (24)	CL	100	100	100	100	100	96	77	34	33	42	22	2.59	19.0	11.10	1.78
C2 -- 41 to 72	A-4 (5)	CL	100	100	100	100	100	77	51	12	11	28	8	2.62	23.0	2.80	1.65
Keeter very fine sandy loam: KtC 6/ (S80TX-497-003)																	
Ap -- 0 to 5	A-4 (0)	SM-SC	100	100	100	100	100	45	36	8	7	26	5	2.60	23.0	1.60	1.66
Bt1 -- 5 to 15	A-7-6 (13)	CL	100	100	100	100	100	66	51	33	31	41	21	2.61	20.0	10.00	1.73
Bt2 -- 15 to 26	A-6 (10)	CL	100	100	100	100	100	68	43	20	18	33	16	2.61	22.0	5.60	1.68
Medlin stony clay: MdE 3/ (S82TX-497-001)																	
A1 -- 0 to 7	A-7-5 (31)	CH	100	100	100	99	96	80	---	---	---	65	33	2.58	19.0	18.20	1.80
Bw and Bx -- 13 to 44	A-7-6 (36)	CH	100	100	100	99	96	83	---	---	---	65	38	2.55	15.0	20.10	1.92
C -- 44 to 60	A-7-6 (53)	CH	100	100	100	99	99	89	---	---	---	79	51	2.72	17.0	22.80	1.92
Mingo silty clay loam: MoB 3/ (S80TX-497-004)																	
A -- 0 to 7	A-7-6 (28)	CL	100	100	100	100	100	92	---	---	---	49	26	2.55	25.0	10.50	1.60
Bt1 -- 7 to 22	A-7-6 (33)	CH	100	100	100	100	100	92	---	---	---	57	30	2.58	17.0	16.90	1.86
Owens very stony clay: OwE 3/ (S78TX-497-001)																	
A -- 0 to 7	A-7-6 (28)	CH	100	91	88	86	84	81	---	---	---	58	31	2.63	16.0	17.50	1.83
Bk -- 7 to 18	A-7-6 (28)	CH	100	88	86	84	80	77	---	---	---	59	33	2.69	19.0	16.80	1.82
C -- 18 to 40	A-7-6 (40)	CH	100	100	100	98	96	94	---	---	---	59	37	2.74	16.0	18.20	1.93
Palopinto extremely stony silty clay loam: PaC 3/ (S80TX-497-001)																	
A1 -- 0 to 4	A-7-6 (22)	CL	100	100	100	99	99	90	---	---	---	45	19	2.60	24.0	9.20	1.61
A2 -- 4 to 15	A-7-6 (24)	CL	100	100	100	99	98	87	---	---	---	47	24	2.65	20.0	11.80	1.73

See footnotes at end of table.

TABLE 17.--ENGINEERING INDEX TEST DATA--Continued

Soil name, map symbol, report number, horizon, and depth in inches	Classification		Grain-size distribution									Liquid limit 2/	Plasticity index 2/	Particle density	Shrinkage		
	AASHTO	Unified	Percentage passing sieve-- 1/						Percentage smaller than--						Limit	Linear	Ratio
			5/8 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm	.005 mm	.002 mm						
												Pct		G/cc	Pct	Pct	Pct
Pulexas very fine sandy loam: Pu 7/ (S78TX-497-005)																	
A -- 0 to 8	A-4 (2)	CL-ML	100	100	100	100	100	61	28	8	8	27	5	2.67	23.0	2.40	1.63
C1 -- 8 to 28	A-4 (3)	CL-ML	100	100	100	100	100	73	43	11	9	26	5	2.64	21.0	2.80	1.70
C3 -- 50 to 70	A-4 (3)	CL-ML	100	100	100	100	100	74	27	11	10	26	6	2.65	23.0	2.00	1.65
Purves clay: PvB 8/ (S78TX-497-004)																	
A2 -- 6 to 14	A-7-5 (45)	CH	100	100	100	99	97	95	81	52	48	71	38	2.62	16.0	20.80	1.84
Selden loamy fine sand: SdB 3/ (S80TX-497-006)																	
E -- 5 to 13	A-2-4 (0)	SP-SM	100	100	100	100	97	9	---	---	---	22	3	2.64	17.0	0.00	1.76
Bt1 -- 13 to 21	A-6 (3)	SC	100	100	100	99	97	42	---	---	---	34	19	2.66	17.0	8.90	1.86
Bt2 -- 21 to 43	A-2-6 (1)	SC	100	100	100	100	98	35	---	---	---	32	15	2.66	18.0	7.10	1.79
Bt4 -- 58 to 70	A-2-7 (3)	SC	100	100	99	96	85	32	---	---	---	47	28	2.63	15.0	14.00	1.81
Silawa fine sandy loam: SfC 3/ (S78TX-497-006)																	
A -- 0 to 4	A-4 (0)	SM-SC	100	100	100	100	99	47	---	---	---	21	4	2.61	17.0	2.20	1.77
Bt1 -- 12 to 28	A-6 (6)	CL	100	100	100	100	100	61	---	---	---	31	14	2.57	17.0	7.70	1.84
Bt3 -- 46 to 59	A-4 (1)	CL-ML	100	100	100	100	99	52	---	---	---	24	6	2.63	20.0	2.50	1.75
Somervell gravelly loam: SoC 3/ (S82TX-497-008)																	
A -- 0 to 10	A-2-6 (0)	SC	100	78	70	58	36	24	---	---	---	33	13	2.59	21.0	6.20	1.75
Bk1 -- 10 to 25	A-2-6 (0)	SC	100	90	75	53	29	20	---	---	---	39	15	2.70	23.0	7.50	1.66
Bk2 -- 25 to 37	A-2-6 (1)	SC	100	83	70	57	44	33	---	---	---	32	15	2.69	18.0	7.10	1.81
Speck clay loam: SpB 9/ (S82TX-497-003)																	
A -- 0 to 5	A-7-6 (26)	CH	100	100	100	100	99	85	---	---	---	54	28	2.55	18.0	15.50	1.84
Bt -- 5 to 15	A-7-6 (32)	CH	100	100	100	100	100	86	---	---	---	58	33	2.58	15.0	18.50	1.94

See footnotes at end of table.

TABLE 17.--ENGINEERING INDEX TEST DATA--Continued

Soil name, map symbol, report number, horizon, and depth in inches	Classification		Grain-size distribution									Liquid limit 2/	Plasti-city index 2/	Particle density	Shrinkage		
	AASHTO	Unified	Percentage passing sieve-- 1/						Percentage smaller than--						Limit	Linear	Ratio
			5/8 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm	.005 mm	.002 mm						
												Pct		G/cc	Pct	Pct	Pct
Weatherford very fine sandy loam: WeC 3/ (S81TX-497-002)																	
A -- 0 to 6	A-4 (2)	CL-ML	100	100	100	100	100	56	---	---	---	27	6	2.61	22.0	2.30	1.63
Bt1 -- 11 to 25	A-6 (6)	CL	100	100	100	100	100	59	---	---	---	30	15	2.65	18.0	6.70	1.79
Bt2 -- 25 to 47	A-4 (3)	CL	100	100	100	100	100	53	---	---	---	29	10	2.63	19.0	5.00	1.72
Windthorst fine sandy loam: WtC 10/ (S78TX-497-008)																	
A -- 0 to 4	A-4 (1)	CL-ML	100	100	100	100	100	68	38	8	6	24	4	2.63	22.0	1.50	1.67
Bt1 -- 8 to 22	A-7-6 (22)	CL	100	100	100	100	100	79	62	40	40	46	27	2.66	16.0	13.60	1.84
BC -- 42 to 56	A-6 (3)	CL	100	100	100	100	100	75	46	20	20	35	15	2.64	22.0	6.30	1.67
Wise clay loam: WzC 3/ (S80TX-497-007)																	
A -- 0 to 7	A-6 (12)	CL	100	100	100	99	99	84	---	---	---	35	15	2.64	20.0	7.20	1.71
Bk -- 18 to 27	A-6 (22)	CL	100	100	100	99	98	93	---	---	---	38	22	2.65	14.0	12.30	1.95

1/ For grain size larger than 3/8 inch, square mesh wire sieves were used that are slightly larger than equivalent round sieves, but these differences do not seriously affect the data.

2/ Liquid limit and plasticity index values were determined by the AASHTO-89 and AASHTO-90 methods, except that soil was added to water.

3/ Location of pedon sample is the same as the pedon given as typical for series in "Soil Series and Their Morphology."

4/ Bastsil fine sandy loam: From U.S. Highway 380 in Decatur, 7.9 miles south on Farm Road 51, south 60 feet.

5/ Duffau fine sandy loam: From the courthouse in Decatur, 3.4 miles north on Farm Road 730, 0.9 mile west on a county road, 8.2 miles north, 0.5 mile northwest, and 900 feet northeast, in rangeland.

6/ Keeter very fine sandy loam: From the courthouse in Decatur, 3.4 miles north on Farm Road 730, 0.9 mile west on a county road, 8.2 miles north, 2.1 miles northeast, 0.3 mile south and east on Forest Service Road, and 80 feet southwest of road.

7/ Pulexas very fine sandy loam: In an area of Pulexas soils, from U.S. Highway 81 in Decatur, 3.2 miles southwest on Farm Road 51, 1 mile west on a county road, 1.6 miles southwest on oil field road, 15 feet south of road and west of stream.

8/ Purves clay: 3.2 miles south of Decatur on U.S. Highway 287, 3.3 miles east on Farm Road 2264, 1.8 miles north on a county road, 0.3 mile west, 100 feet north of road.

9/ Speck clay loam: From Farm Road 730 in Decatur, 1 mile southeast on U.S. Highway 287, north of highway to property line fence.

10/ Windthorst very fine sandy loam: 0.1 mile north on Farm Road 1655 in Alvord, 0.2 mile southeast on a county road, 0.1 mile north, 1.3 miles east, road cut on north side of road.

TABLE 18.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Aledo	Loamy-skeletal, carbonatic, thermic Lithic Haplustolls
Anocon	Fine, mixed, thermic Udic Argiustolls
Balsora	Fine-silty, siliceous, nonacid, thermic Typic Ustifluvents
Bastsil	Fine-loamy, siliceous, thermic Udic Paleustalfs
Blanket	Fine, mixed, thermic Pachic Argiustolls
Bolar	Fine-loamy, carbonatic, thermic Typic Calciustolls
Bonti	Fine, mixed, thermic Ultic Paleustalfs
Brackett	Fine-loamy, carbonatic, thermic Typic Ustochrepts
Chaney	Fine, mixed, thermic Aquic Paleustalfs
Cisco	Fine-loamy, siliceous, thermic Udic Haplustalfs
Cona	Fine, mixed, thermic Udic Paleustalfs
Darnell	Loamy, siliceous, thermic, shallow Udic Ustochrepts
*Deleon	Fine, mixed, thermic Udertic Haplustolls
Duffau	Fine-loamy, siliceous, thermic Udic Paleustalfs
*Exray	Clayey, mixed, thermic Lithic Rhodustalfs
Frio	Fine, montmorillonitic, thermic Cumulic Haplustolls
Hassee	Fine, montmorillonitic, thermic Mollic Albaqualfs
Heaton	Loamy, siliceous, thermic Arenic Paleustalfs
Hensley	Clayey, mixed, thermic Lithic Rhodustalfs
Keeter	Fine-silty, siliceous, thermic Udic Haplustalfs
Lindy	Fine, mixed, thermic Udic Haplustalfs
May	Fine-loamy, siliceous, thermic Udic Haplustalfs
Medlin	Fine, montmorillonitic, thermic Udorthentic Chromusterts
Mingo	Fine, montmorillonitic, thermic Pachic Argiustolls
Nimrod	Loamy, siliceous, thermic Aquic Arenic Paleustalfs
Owens	Clayey, mixed, thermic, shallow Typic Ustochrepts
Palopinto	Loamy-skeletal, mixed, thermic Lithic Haplustolls
Patilo	Loamy, siliceous, thermic Grossarenic Paleustalfs
Ponder	Fine, montmorillonitic, thermic Vertic Haplustalfs
Pulexas	Coarse-loamy, siliceous, nonacid, thermic Typic Ustifluvents
*Purves	Clayey, montmorillonitic, thermic Lithic Calciustolls
San Saba	Fine, montmorillonitic, thermic Udic Pellusterts
Sanger	Fine, montmorillonitic, thermic Udic Chromusterts
Selden	Fine-loamy, siliceous, thermic Aquic Paleustalfs
Set	Fine-silty, carbonatic, thermic Typic Calciustolls
*Silawa	Fine-loamy, siliceous, thermic Ultic Haplustalfs
Slidell	Fine, montmorillonitic, thermic Udic Pellusterts
Somervell	Loamy-skeletal, carbonatic, thermic Typic Calciustolls
*Speck	Clayey, mixed, thermic Lithic Argiustolls
Thurber	Fine, montmorillonitic, thermic Typic Haplustalfs
Trinity	Very-fine, montmorillonitic, thermic Typic Pelluderts
Truce	Fine, mixed, thermic Udic Paleustalfs
Venus	Fine-loamy, mixed, thermic Typic Calciustolls
Vernon	Fine, mixed, thermic Typic Ustochrepts
Weatherford	Fine-loamy, siliceous, thermic Ultic Haplustalfs
Westfork	Fine, mixed, thermic Cumulic Haplustolls
Windthorst	Fine, mixed, thermic Udic Paleustalfs
Wise	Fine-silty, siliceous, thermic Typic Ustochrepts

* The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

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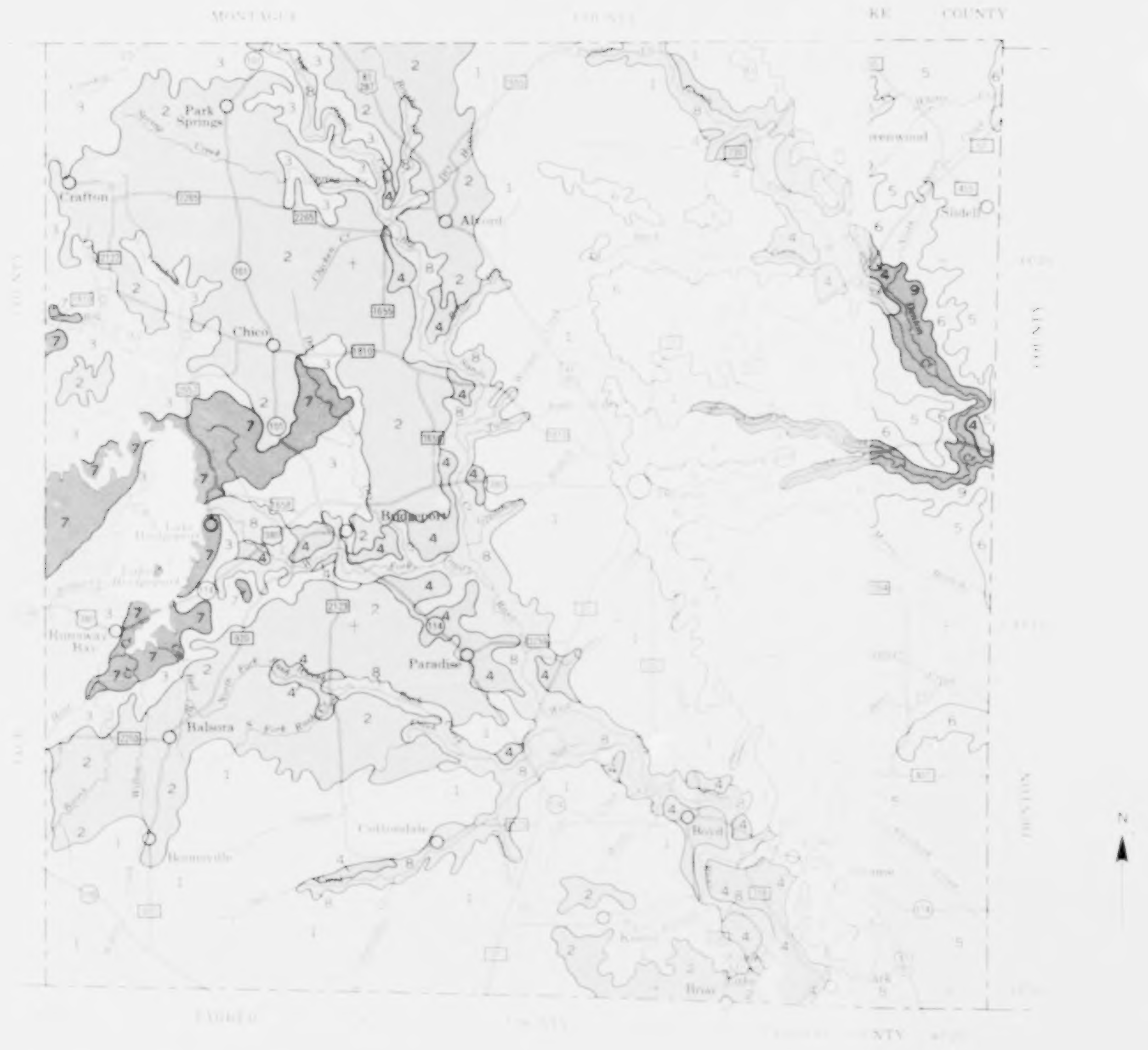

MONTAGUE COUNTY
COOKE COUNTY
DENTON COUNTY
JACK COUNTY
PARKER COUNTY
TARRANT COUNTY
Park Springs
Crafton
Alvord
Chico
Bridgeport
Lake Bridgeport
Runaway Bay
Paradise
Balsora
Cottondale
Boyd
Slidell
Newark
N

[illegible]

LEGEND*

DOMINANTLY GENTLY SLOPING TO SLOPING, NEUTRAL TO SLIGHTLY ACID SOILS FORMED IN MATERIAL WEATHERED FROM SANDSTONES AND SHALES; ON UPLAND AND TERRACE SAVANNAHS

1 Duffau-Keeter-Weatherford: Deep, loamy and sandy, well drained soils underlain by weakly cemented sandstone or stratified loamy material; on uplands

2 Windthorst-Chaney-Selden: Deep, loamy and sandy, moderately well drained soils underlain by stratified loamy and clayey material; on uplands

3 Truce-Cona: Deep, loamy, well drained soils underlain by shaly clay or sandstone; on uplands

4 Bastsil-Silawa: Deep, loamy and sandy, well drained soils underlain by loamy and sandy material; on terraces

DOMINANTLY GENTLY SLOPING TO STRONGLY SLOPING, NEUTRAL TO MODERATELY ALKALINE SOILS FORMED IN MATERIAL WEATHERED FROM LIMESTONES AND MARLS; ON UPLAND PRAIRIES

5 Sanger-Purves-Somervell: Very shallow to deep, clayey and loamy, well drained soils underlain by clays and interbedded limestones and marls

6 Venus-Aledo-Somervell: Very shallow to deep, loamy, well drained soils underlain by interbedded limestone and marl or loamy material

7 Palopinto-Hensley-Lindy: Very shallow to moderately deep, loamy, well drained soils underlain by limestone

DOMINANTLY NEARLY LEVEL, NEUTRAL TO MODERATELY ALKALINE SOILS FORMED IN ALLUVIUM; ON FLOOD PLAINS

8 Pulexas-Balsora-Deleon: Deep, loamy and clayey, well drained and moderately well drained soils underlain by loamy and clayey alluvium

9 Frio-Trinity: Deep, loamy and clayey, well drained and somewhat poorly drained soils underlain by loamy and clayey sediment

*The reaction and texture given in these descriptive headings refer to the surface layer of major soils.

Compiled 1985

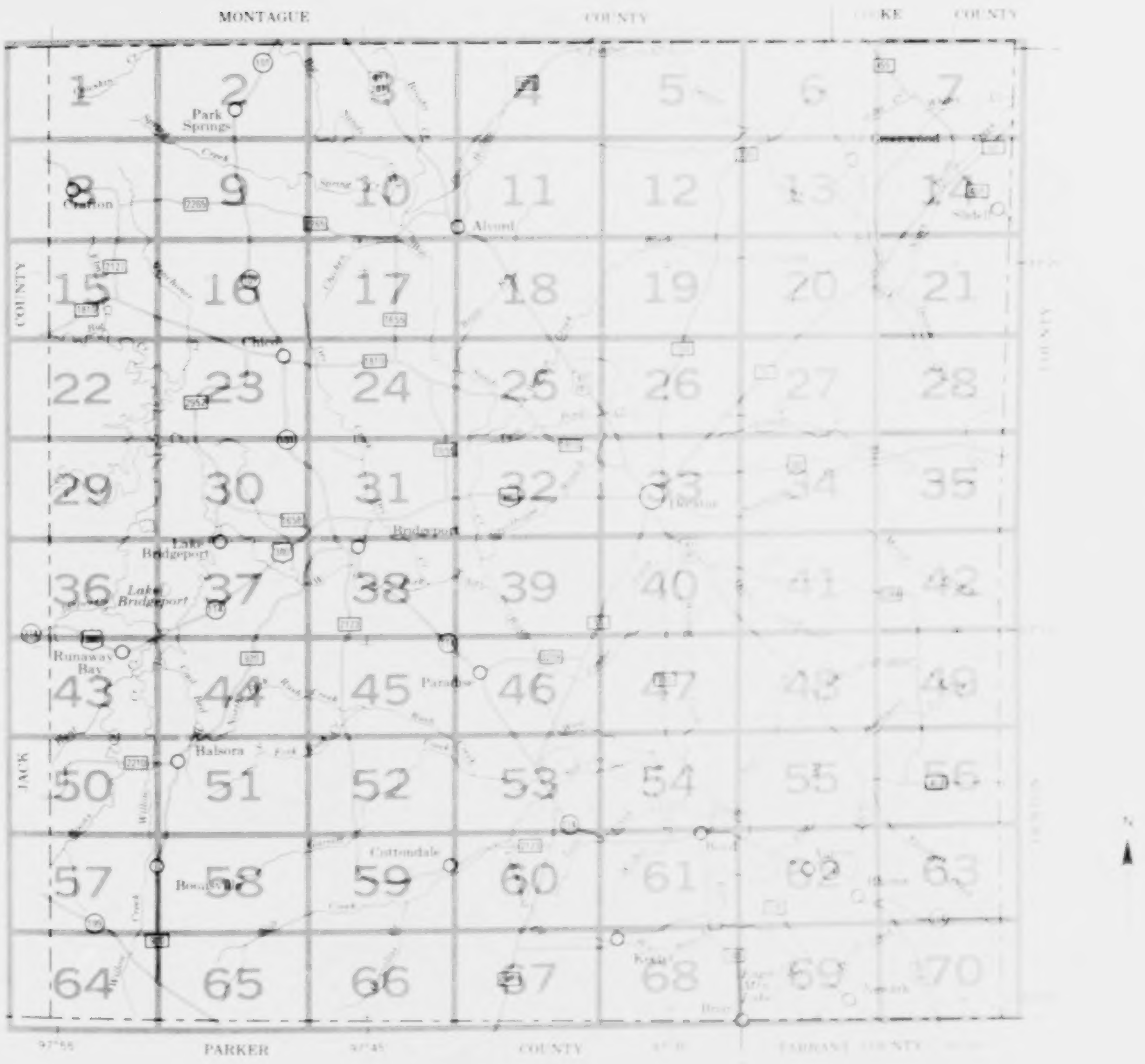
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
FOREST SERVICE
TEXAS AGRICULTURAL EXPERIMENT STATION
TEXAS STATE SOIL AND WATER CONSERVATION BOARD

GENERAL SOIL MAP
WISE COUNTY, TEXAS

Scale 1:253,440

1 ½ 0 1 2 3 4 Miles

1 0 4 8 Km


MONTAGUE COUNTY
COOKE COUNTY
JACK COUNTY
DENTON COUNTY
PARKER COUNTY
TARRANT COUNTY
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97°45'
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Park Springs
Crafton
Alvord
Greenwood
Slidell
Chico
Decatur
Bridgeport
Lake Bridgeport
Runaway Bay
Paradise
Balsora
Cottondale
Boonsville
Rhome
Aurora
Newark
Boyd

INDEX TO MAP SHEETS

WISE COUNTY, TEXAS

Scale 1:253,440

SOIL LEGEND

SYMBOL	NAME	SYMBOL	NAME

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

State or province

Parish

BOUNDARY

COORDINATE TICK

Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

Farmstead, house (omit in urban areas)

Church

School

Indian mound (label)

Located object (label)

Tank (label)

Wells, oil or gas

Windmill

Kitchen midden

WATER FEATURES

DRAINAGE

Perennial, double line

Perennial, single line

Intermittent

Drainage end

Canals or ditches

Double-line (label)

Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

Perennial

Intermittent

MISCELLANEOUS WATER FEATURES

Marsh or swamp

Spring

Well, artesian

Well, irrigation

Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS DuB KtC

ESCARPMENTS

Bedrock (points down slope)

Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE (normally not shown)

MISCELLANEOUS

Blowout

Clay spot

Gravelly spot

Gumbo, slick or scabby spot (sodic)

Dumps and other similar non soil areas

Prominent hill or peak

Rock outcrop (includes sandstone and shale)

Saline spot

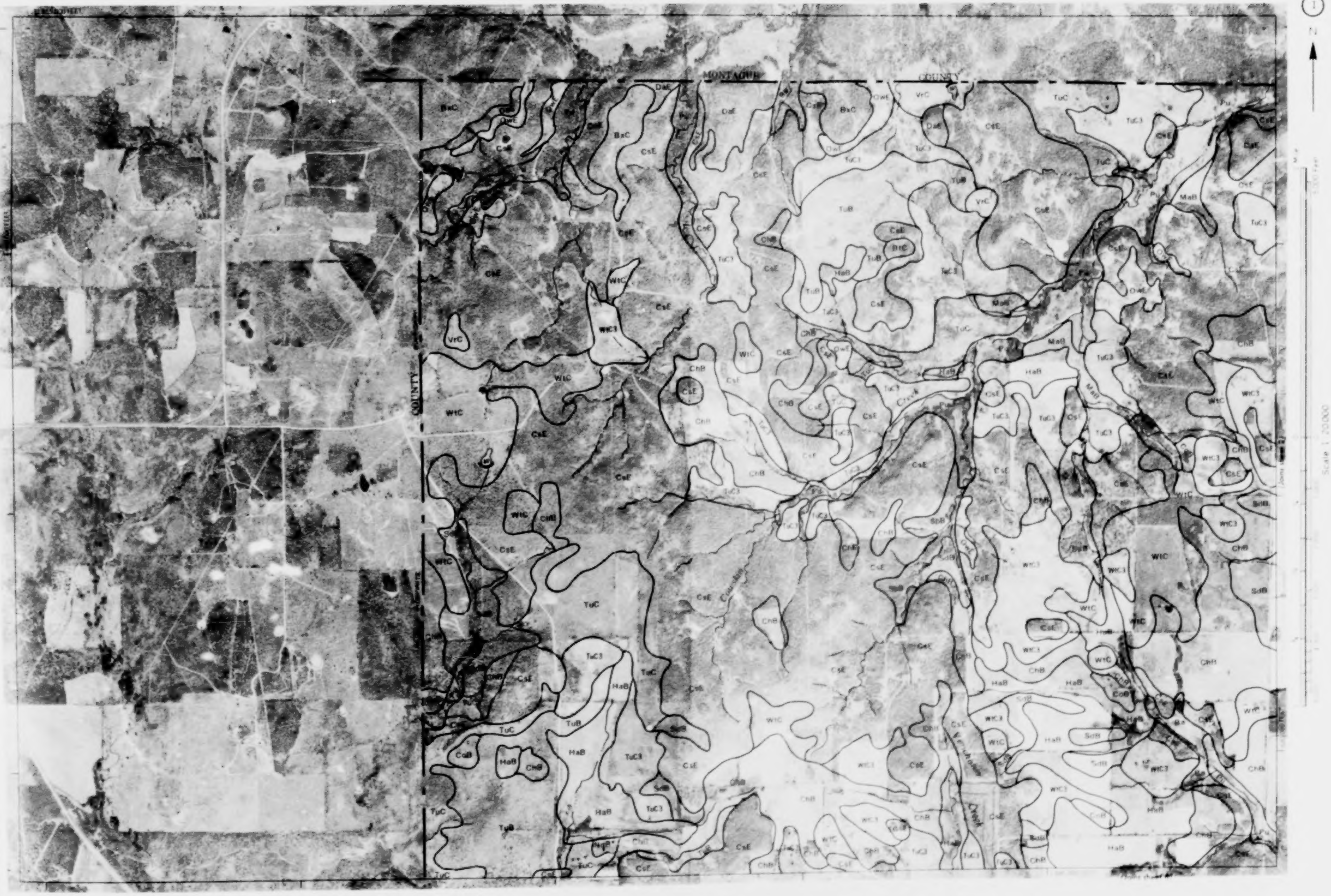
Sandy spot

Severely eroded spot

Slide or slip (tips point upslope)

Stony spot, very stony spot

WISE COUNTY, TEXAS — SHEET NUMBER 1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N
MONTAGUE
COUNTY
COUNTY
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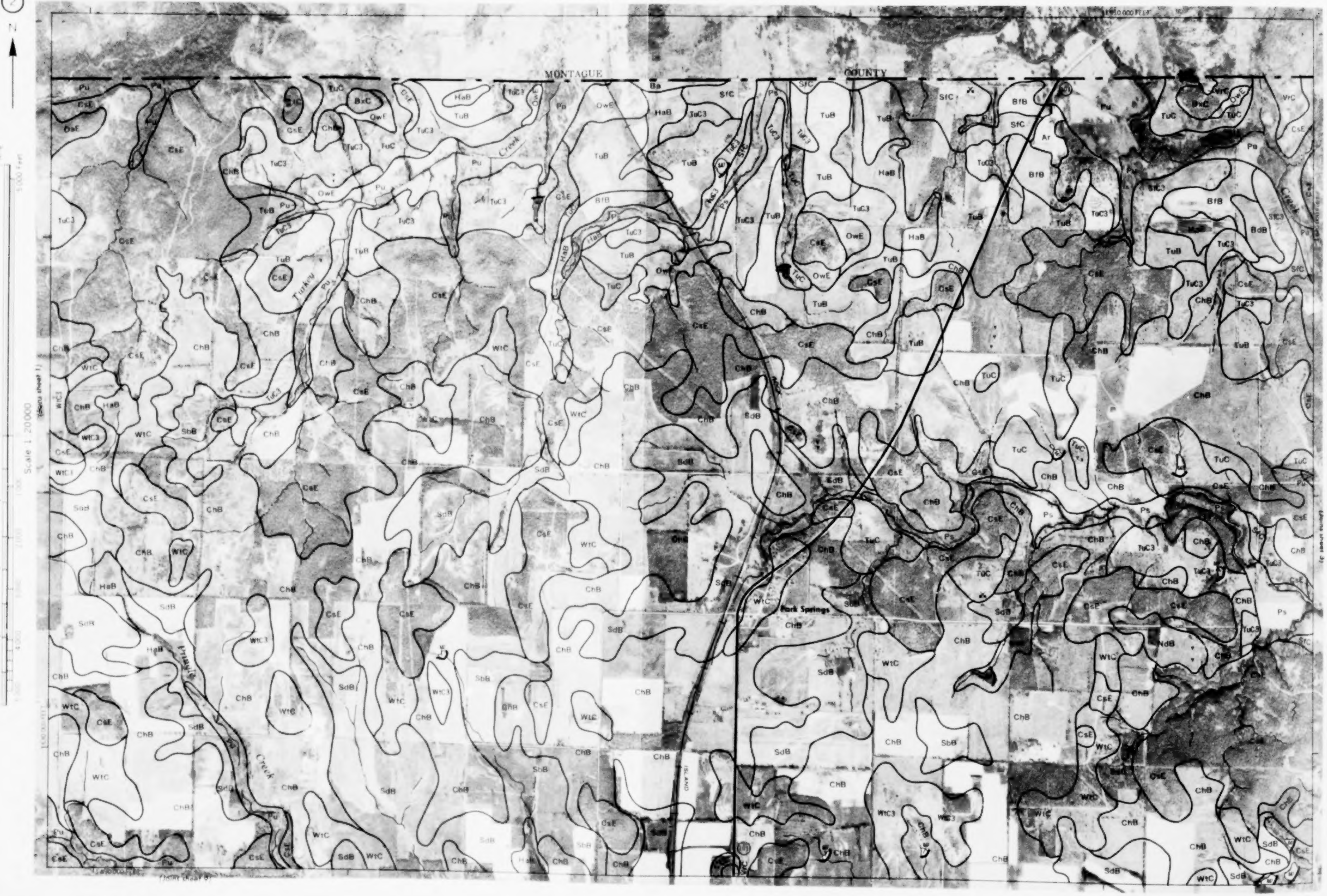
BxC
DaE
CsE
VrC
TuC
TuC3
TuB
HaB
ChB
WtC
WtC3
MaB
OwE
SdB
CoB
BtC
Pu
Creek

②

WISE COUNTY, TEXAS — SHEET NUMBER 2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5000 Feet
1 Mile
MONTAGUE
COUNTY
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(Joins sheet 3)
(Joins sheet 9)
Turkey Creek
Creek
Park Springs
ISLAND
CsE
ChB
TuB
TuC
TuC3
WtC
WtC3
SdB
HaB
OwE
Pu
Ps
BfB
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BdB
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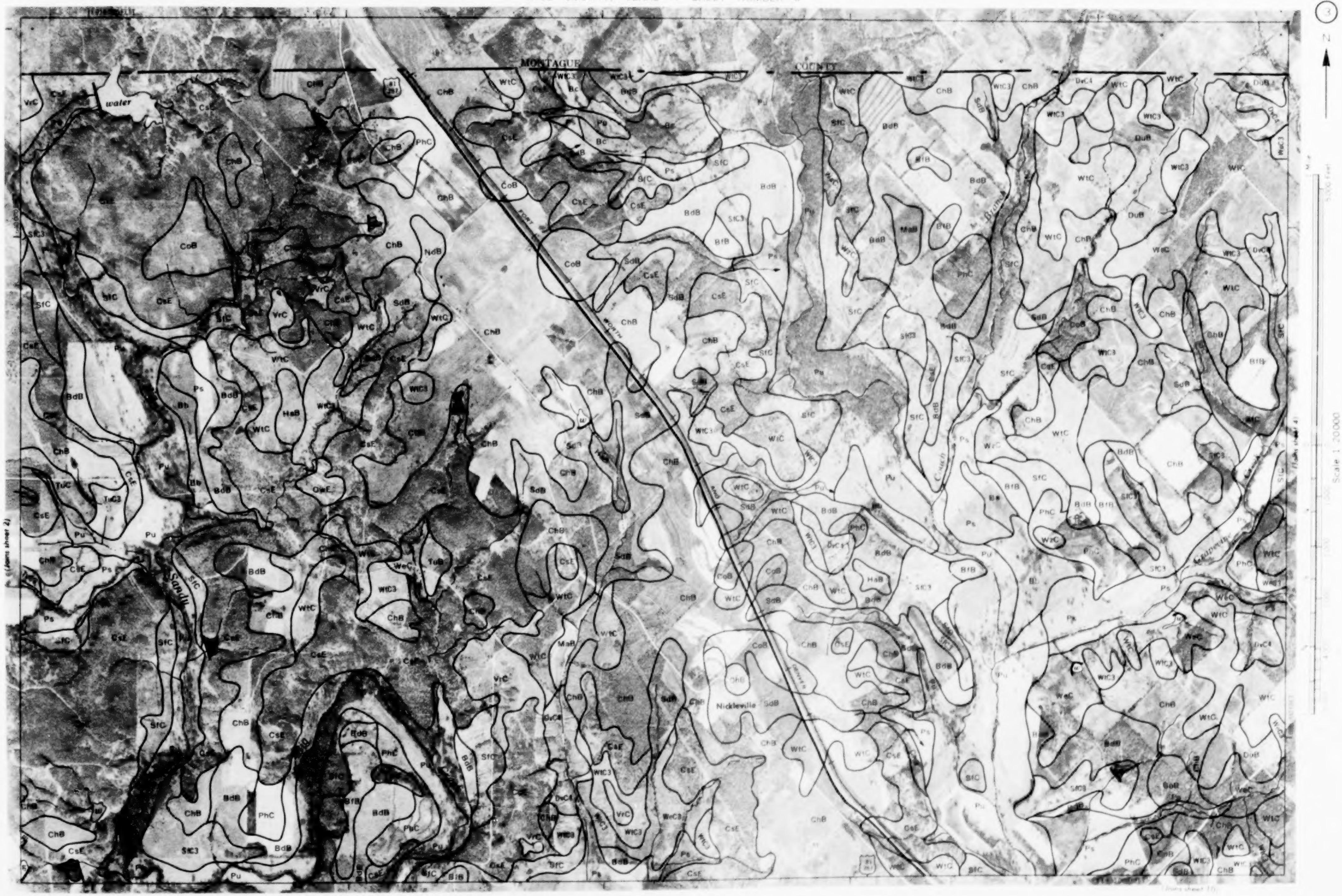
NdB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MONTAGUE
COUNTY
water
Nickleville
Scale 1:20000
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(Joins sheet 10)
ChB
CsE
WtC
SfC
BdB
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PhC
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SdB
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DuB
WeC

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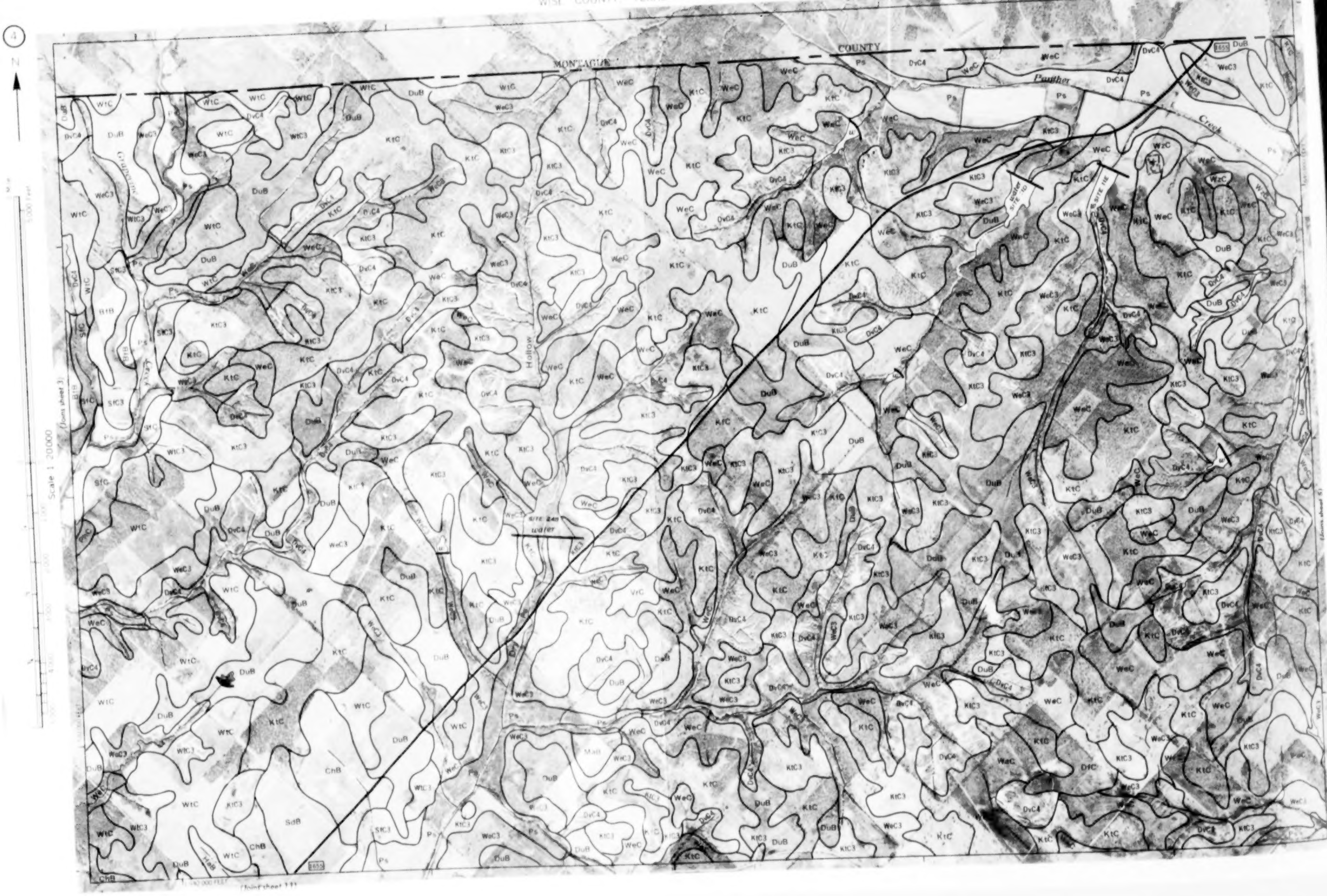
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Hollow
Creek
site 24B water
water site 10
site 11E
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(Joins sheet 5)
(Joins sheet 11)
1 810 000 FEET
1 950 000 FEET
1659
WtC
WtC3
DuB
DvC4
WeC
WeC3
KtC
KtC3
Ps
SfC
SfC3
BtB
WzC
VrC
MaB
ChB
SdB
DrC

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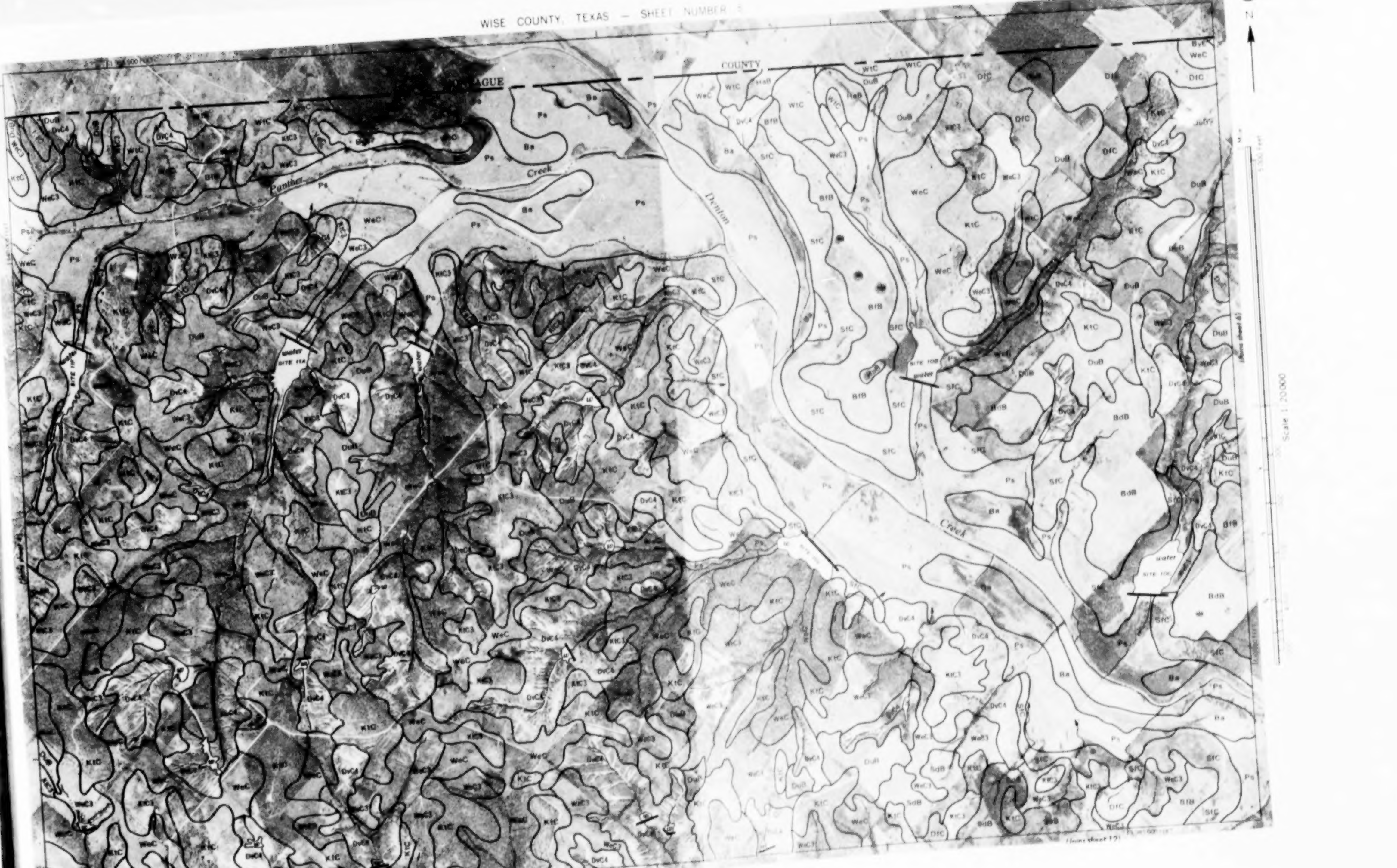
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MONTAGUE COUNTY
Panther Creek
Denton Creek
water
SITE 11A
SITE 10B
SITE 10C
Ps
Ba
WeC
WeC3
KtC
KtC3
DuB
DvC4
BfB
SfC
WtC
DfC
BdB
HaB
SdB
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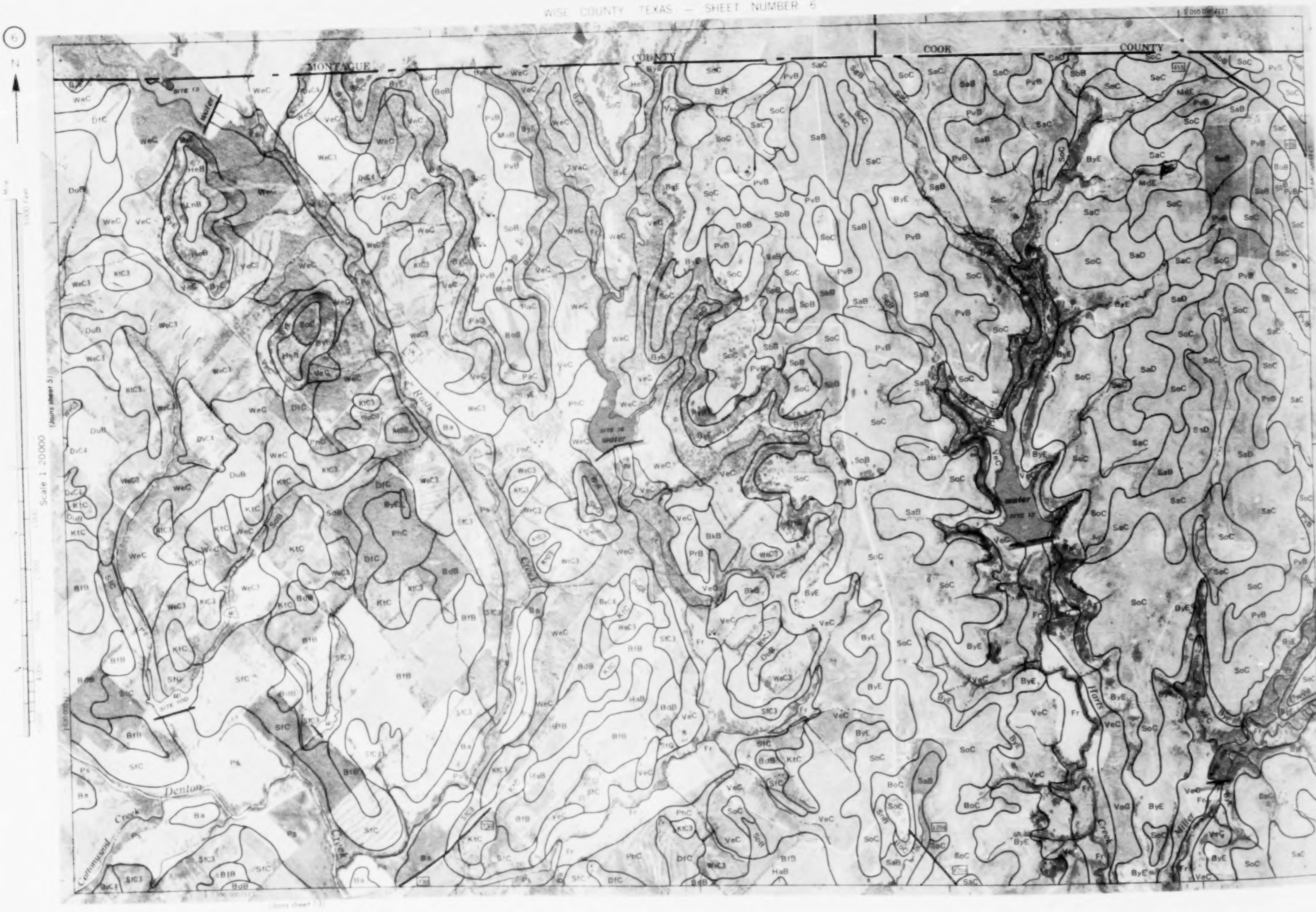
⑥

WISE COUNTY, TEXAS — SHEET NUMBER 5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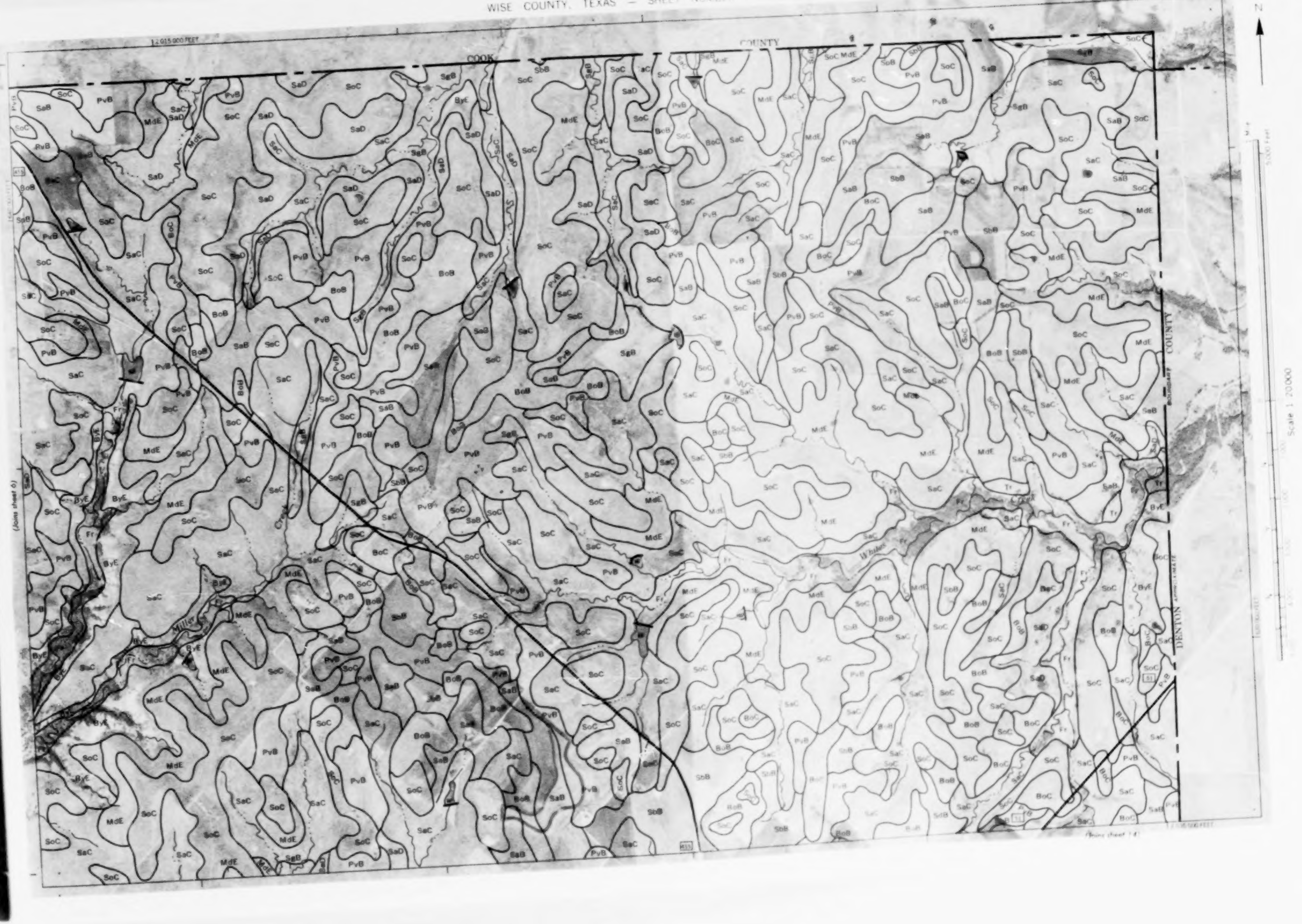
MONTAGUE
COUNTY
COOK
COUNTY
SITE 13
water
SITE 16
water
water
SITE 17
SITE 20D
Rush Creek
Denton
Cottonwood Creek
Creek
Harts Creek
Miller

WISE COUNTY, TEXAS — SHEET NUMBER 7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DENTON COUNTY
BOUNDARY
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Whites
Creek
Miller
Cr.
SoC
SaC
SaD
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PvB
MdE
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BoC
ByE
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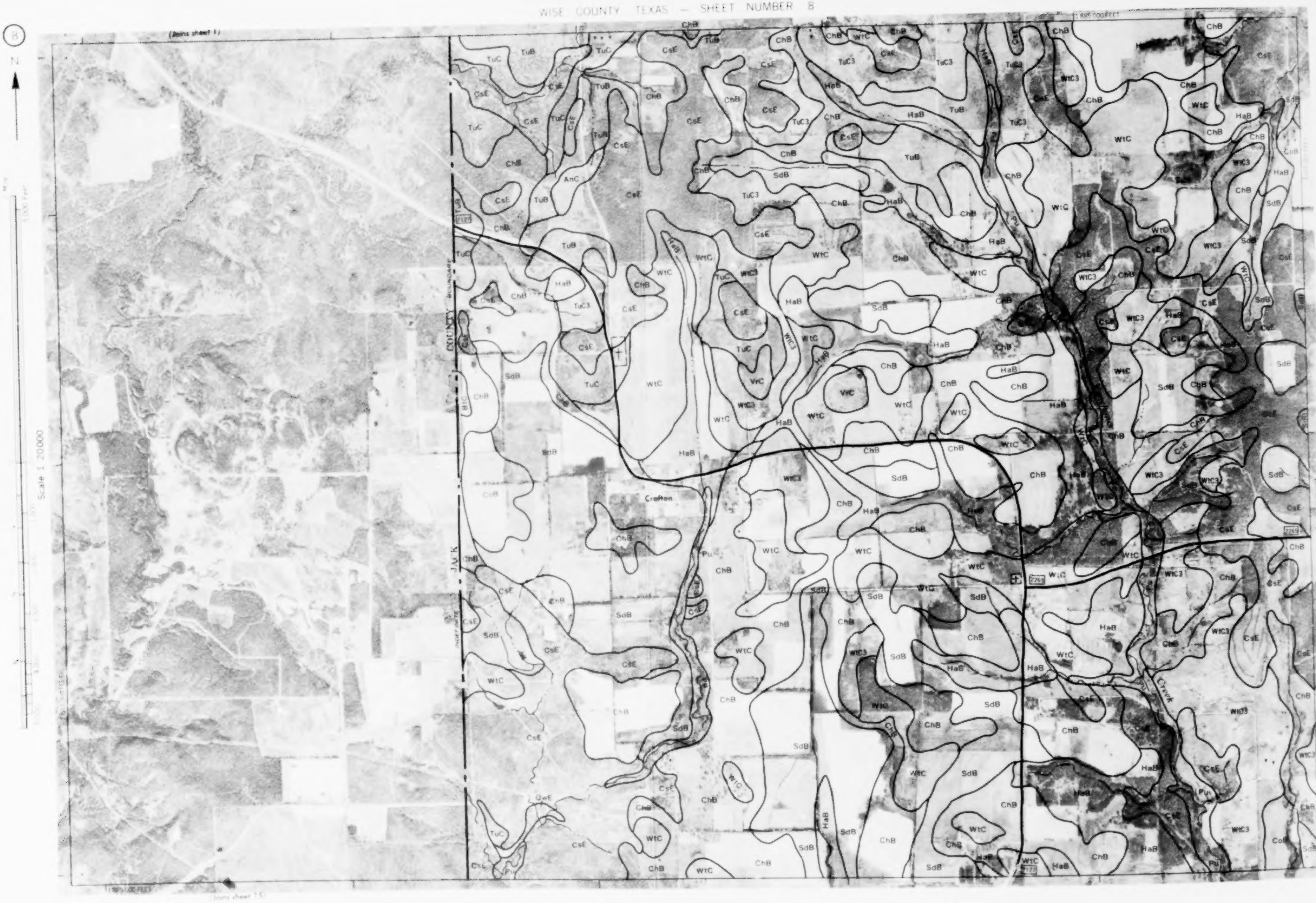
Tr
SbB
SgB

WISE COUNTY, TEXAS — SHEET NUMBER 8



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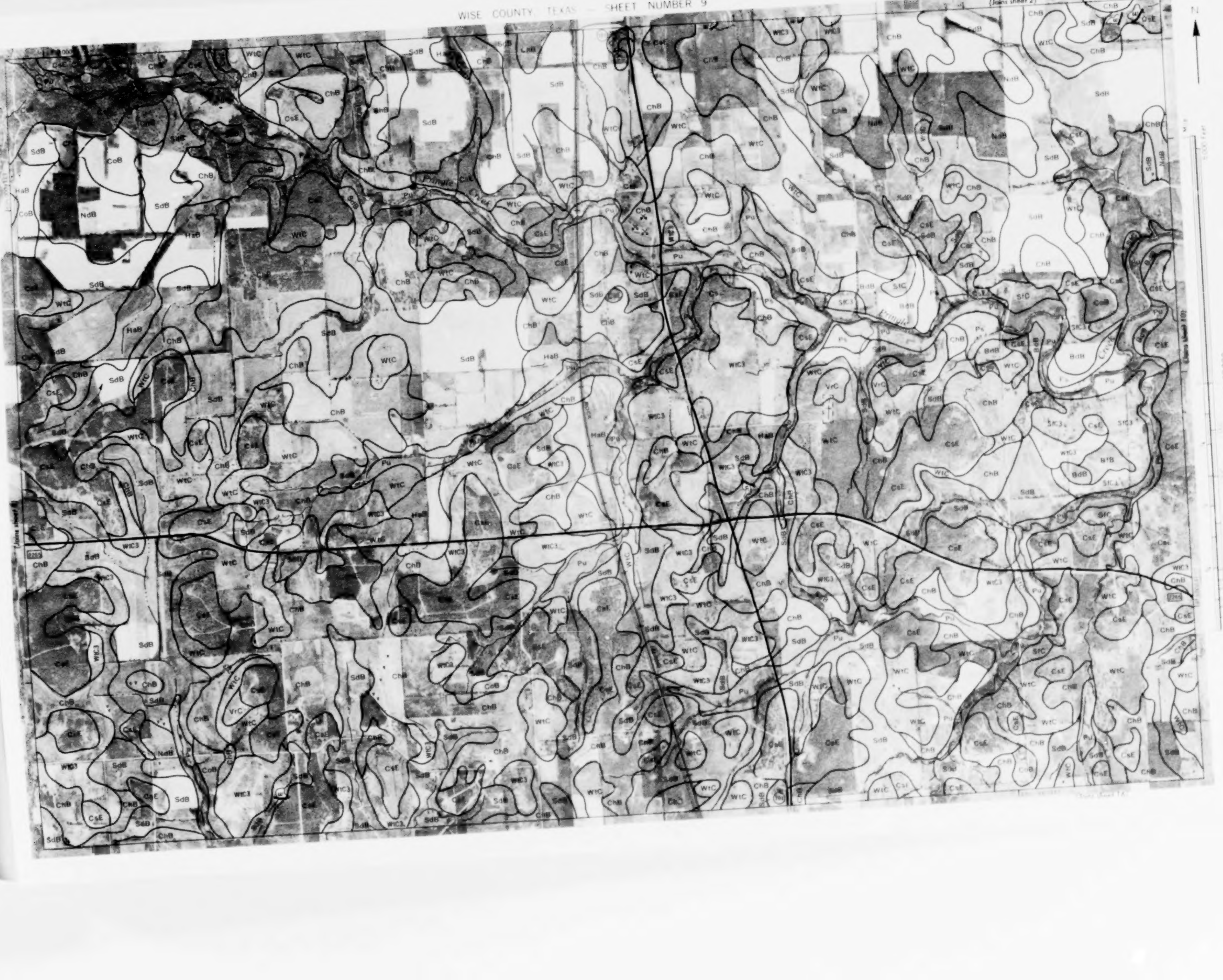
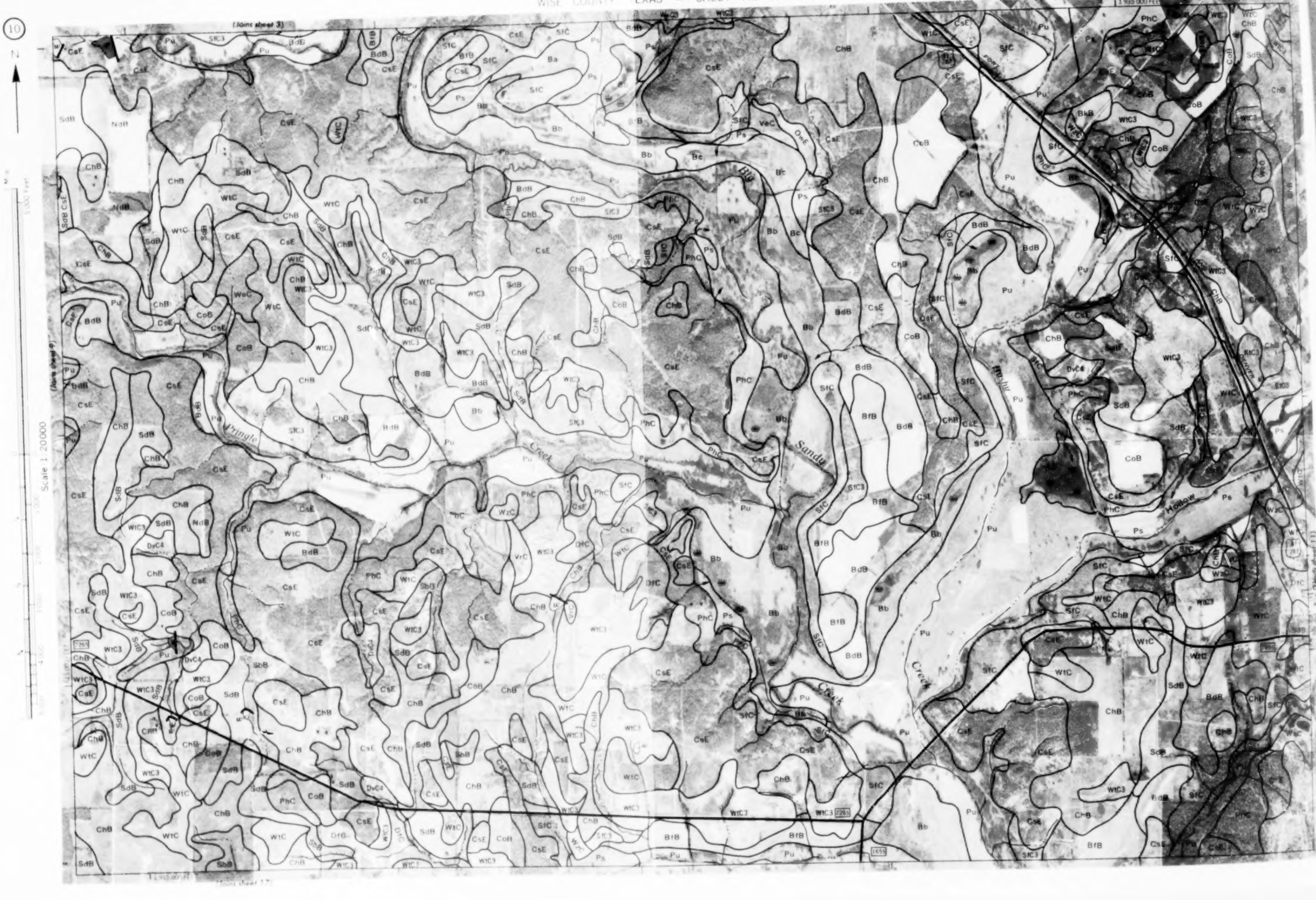
(Joins sheet 9)
Scale 1:20000
5000 Feet
JACK COUNTY BOUNDARY
Crafton
Creek
1 885 000 FEET
1 895 000 FEET
2127
2265
ChB
CsE
TuB
TuC
TuC3
HaB
SdB
WtC
WtC3
AnC
Pu
CoB
OwE
BtC

WISE COUNTY, TEXAS — SHEET NUMBER 9

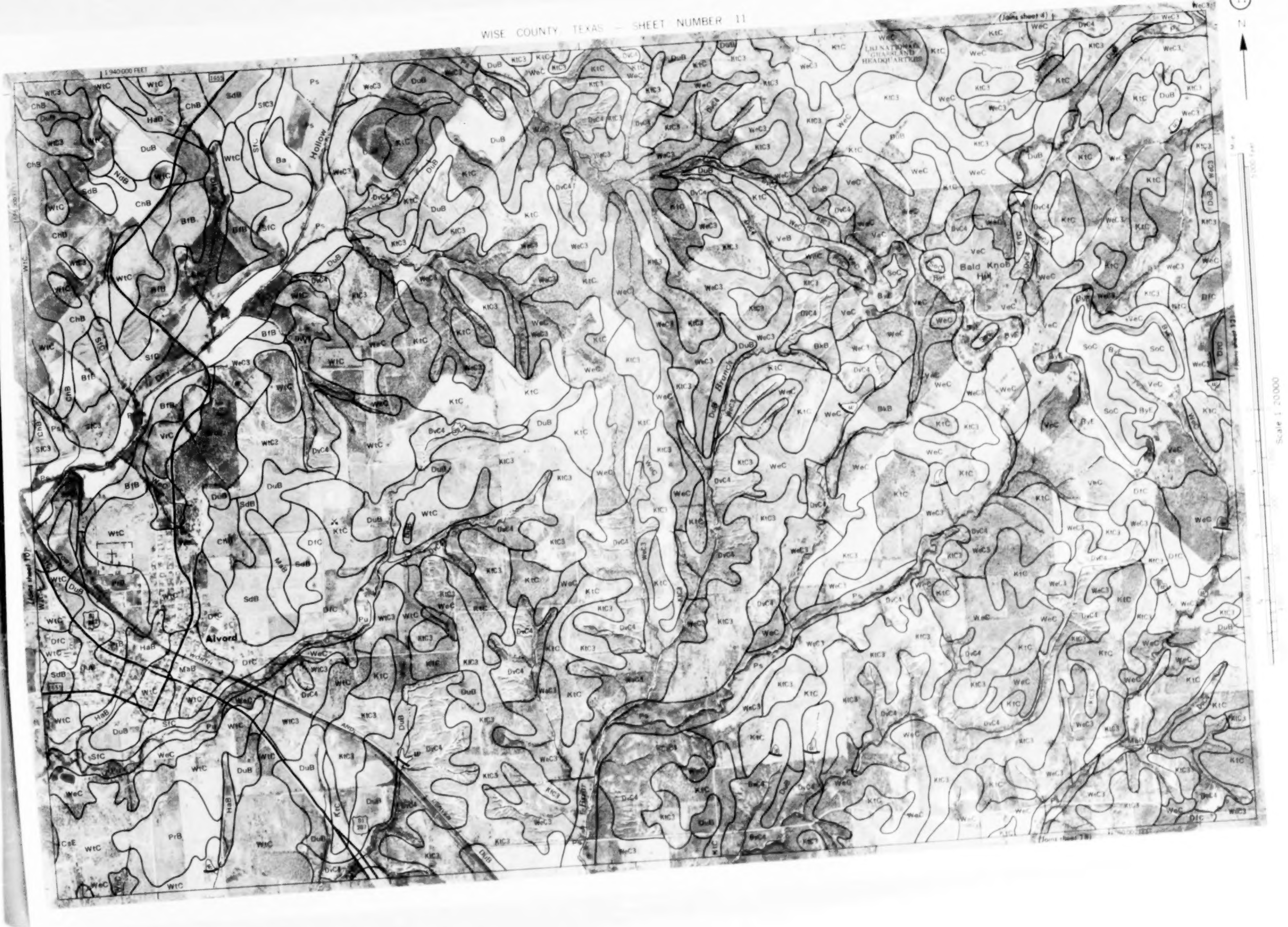
⑨


(Joins sheet 2)
(Joins sheet 10)
(Joins sheet 8)
(Joins sheet 16)
N
5000 Feet
Scale 1:20000
Creek
ChB
SdB
WtC
WtC3
CsE
CoB
NdB
HaB
Pu
Ps
BdB
StC
StC3
VrC

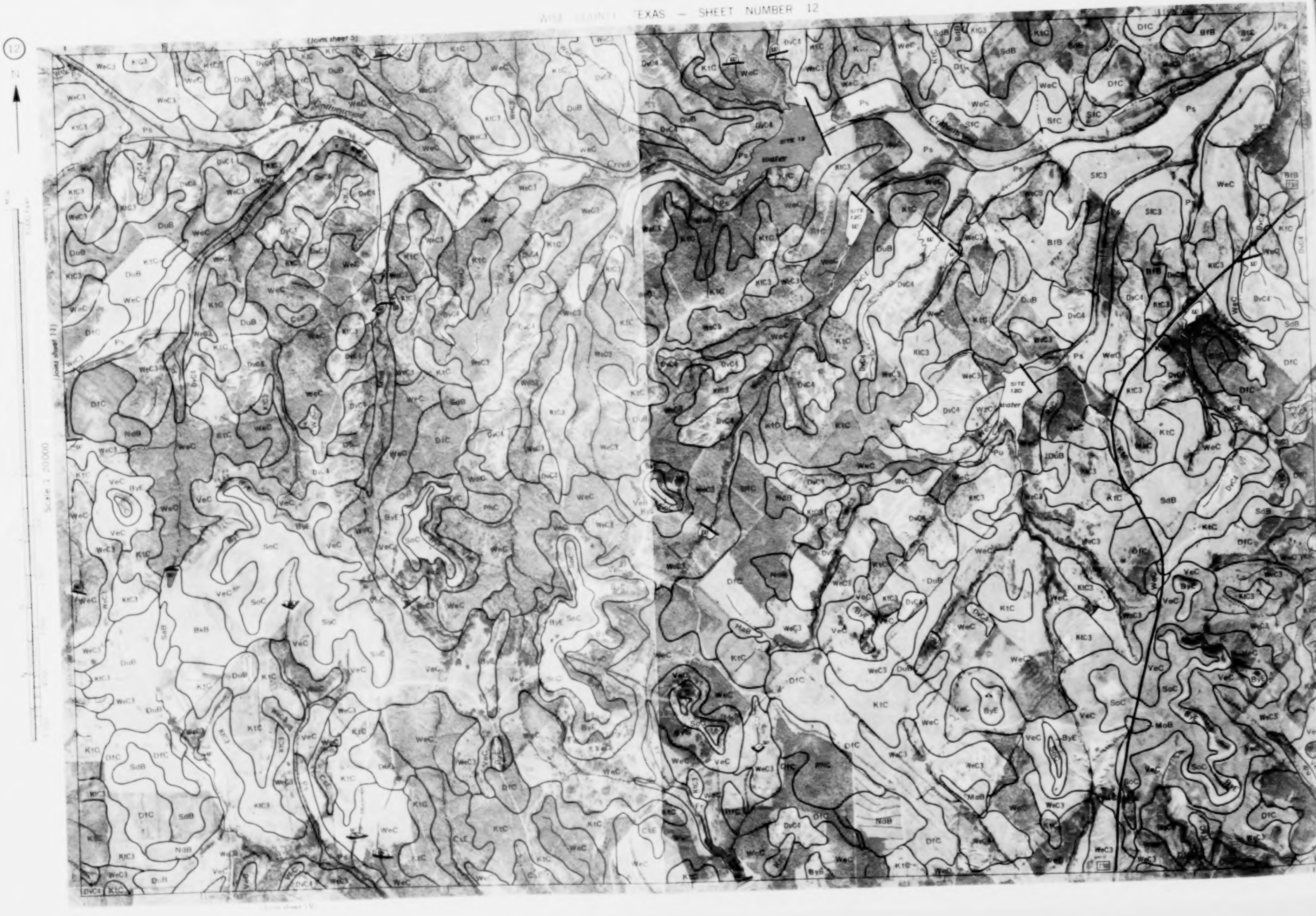
WISE COUNTY TEXAS — SHEET NUMBER 10


N
(Joins sheet 3)
(Joins sheet 9)
(Joins sheet 11)
(Joins sheet 17)
Scale 1:20000
5000 Feet
1 935 000 FEET
Pringle Creek
Big Sandy Creek
Hollow
2265
1655

WISE COUNTY, TEXAS — SHEET NUMBER 11

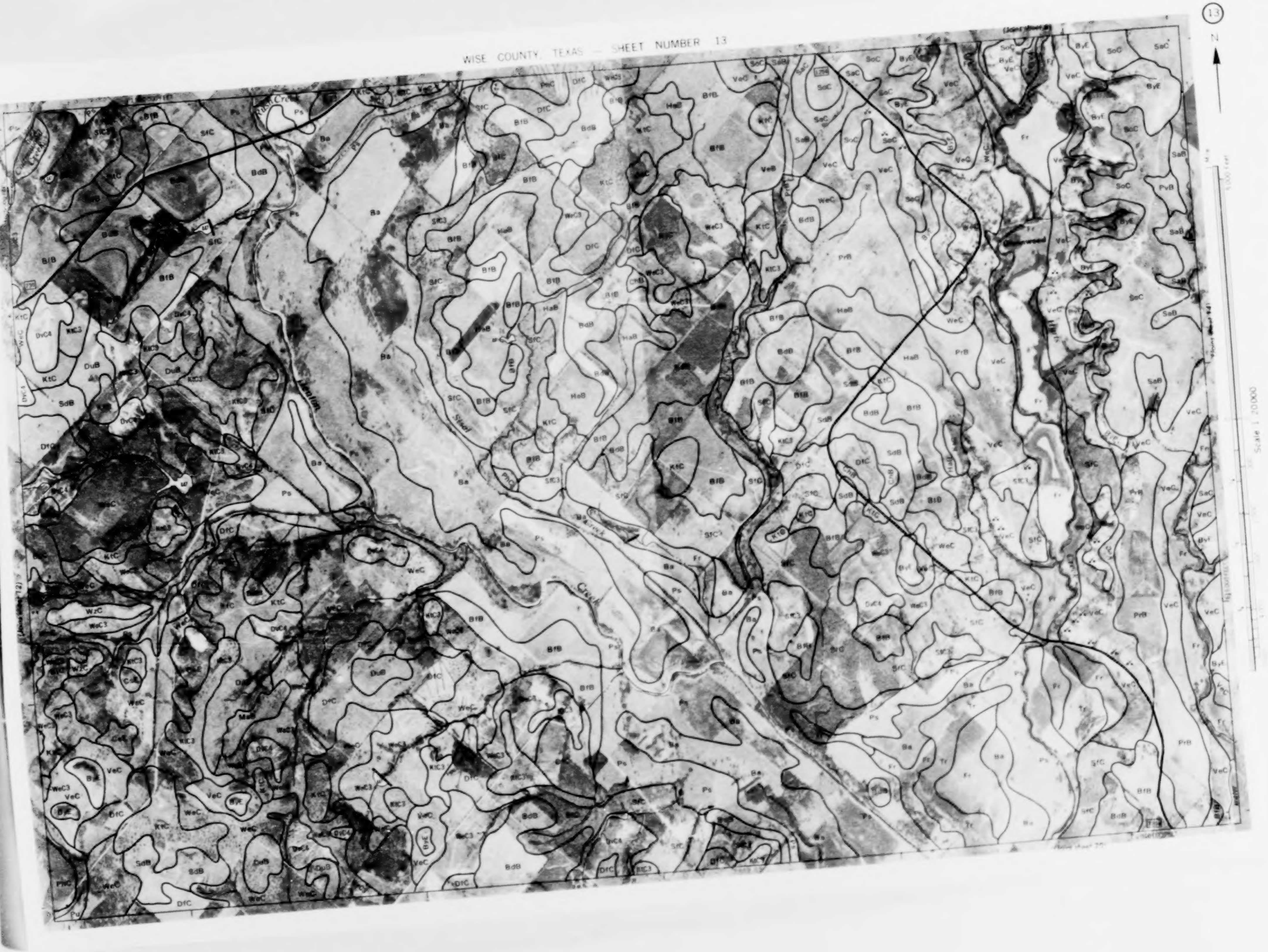

N
Scale 1:20 000
5000 Feet
1 940 000 FEET
(Joins sheet 4)
(Joins sheet 10)
(Joins sheet 12)
(Joins sheet 18)
LBJ NATIONAL GRASSLAND HEADQUARTERS
Bald Knob Hill
Hollow
Branch
Alvord
1655
287
WtC
WtC3
ChB
HaB
DuB
SdB
SfC3
Ps
WeC
WeC3
KtC
KtC3
DvC4
VeC
VeB
SoC
ByE
BfB
NdB
Ba
DfC
MaB
PrB
CsE
Pu
VfC

WISE COUNTY, TEXAS — SHEET NUMBER 12

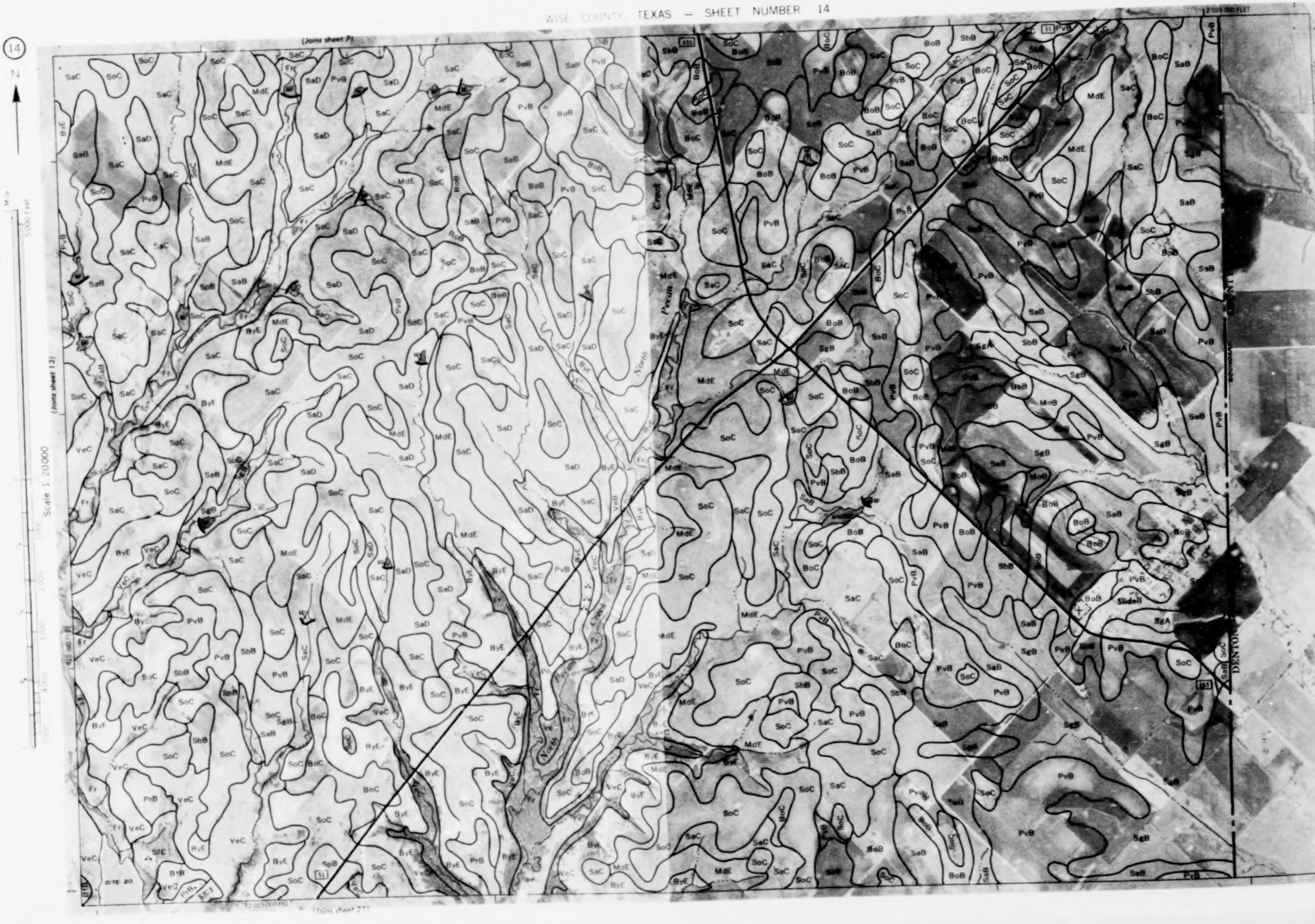


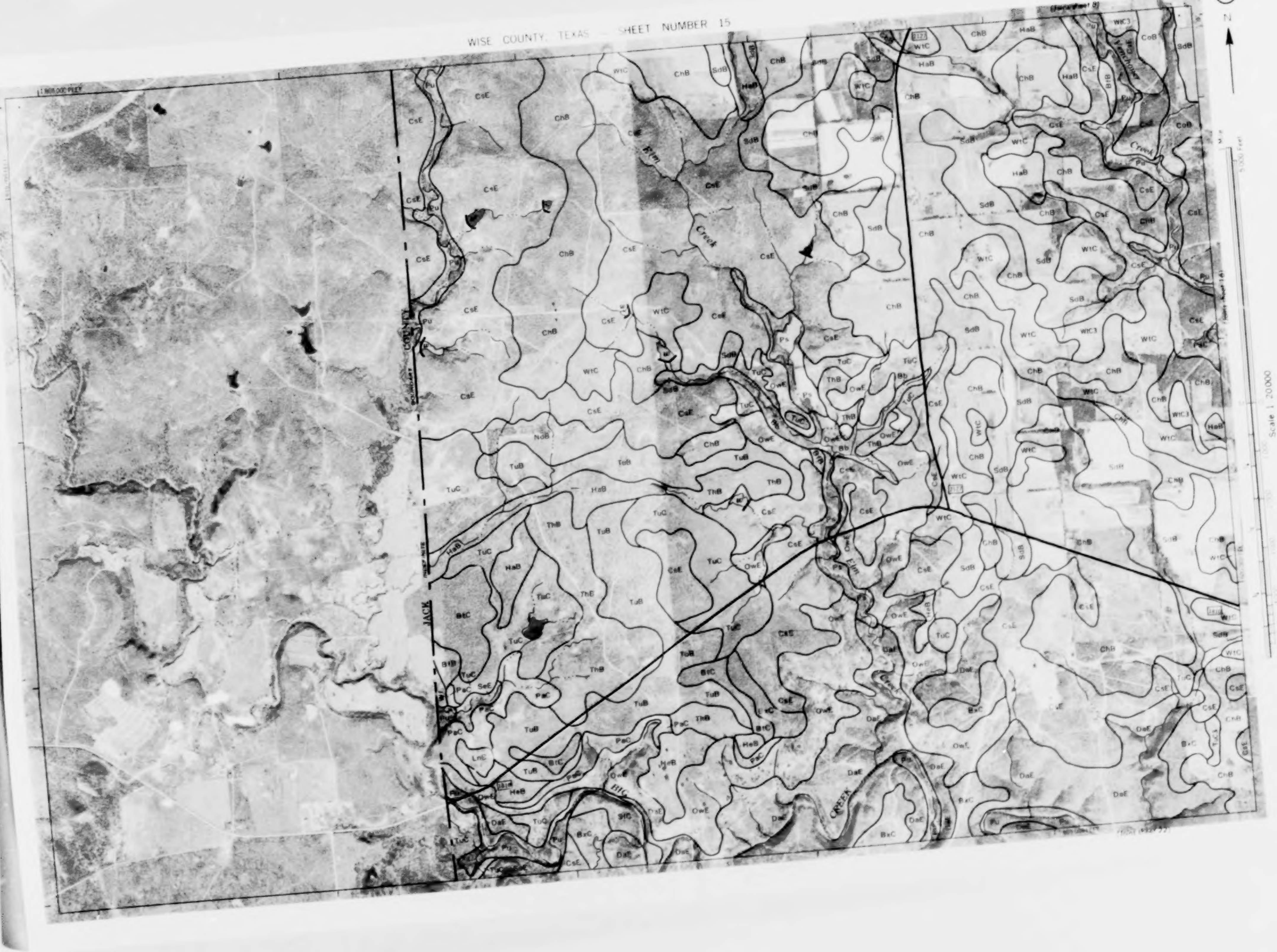
12
N
Scale 1:20000
(Joins sheet 5)
(Joins sheet 11)
(Joins sheet 13)
(Joins sheet 19)
Cottonwood
Creek
SITE 12C
SITE 12D
SITE 18
water
Ps
WeC
WeC3
KtC
KtC3
DuB
DfC
DvC4
SfC
SfC3
BfB
SdB
VeC
ByE
SoC
NdB
MoB
PhC
Pu

WISE COUNTY, TEXAS — SHEET NUMBER 13

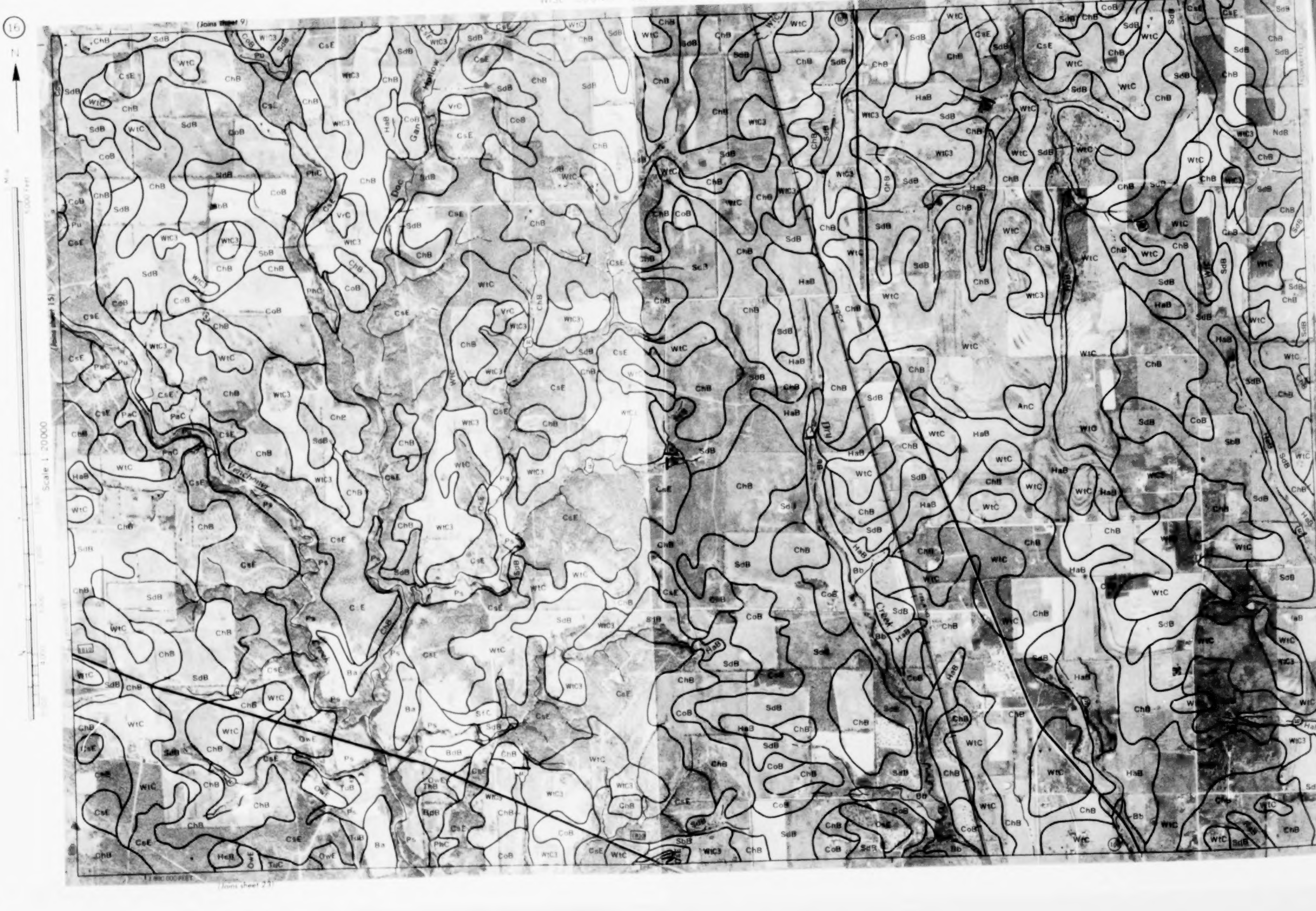

⑬
N
1 Mile
5000 Feet
Scale 1:20 000
Rush Creek
Denton
Creek
Slate
Greenwood

WISE COUNTY, TEXAS — SHEET NUMBER 14

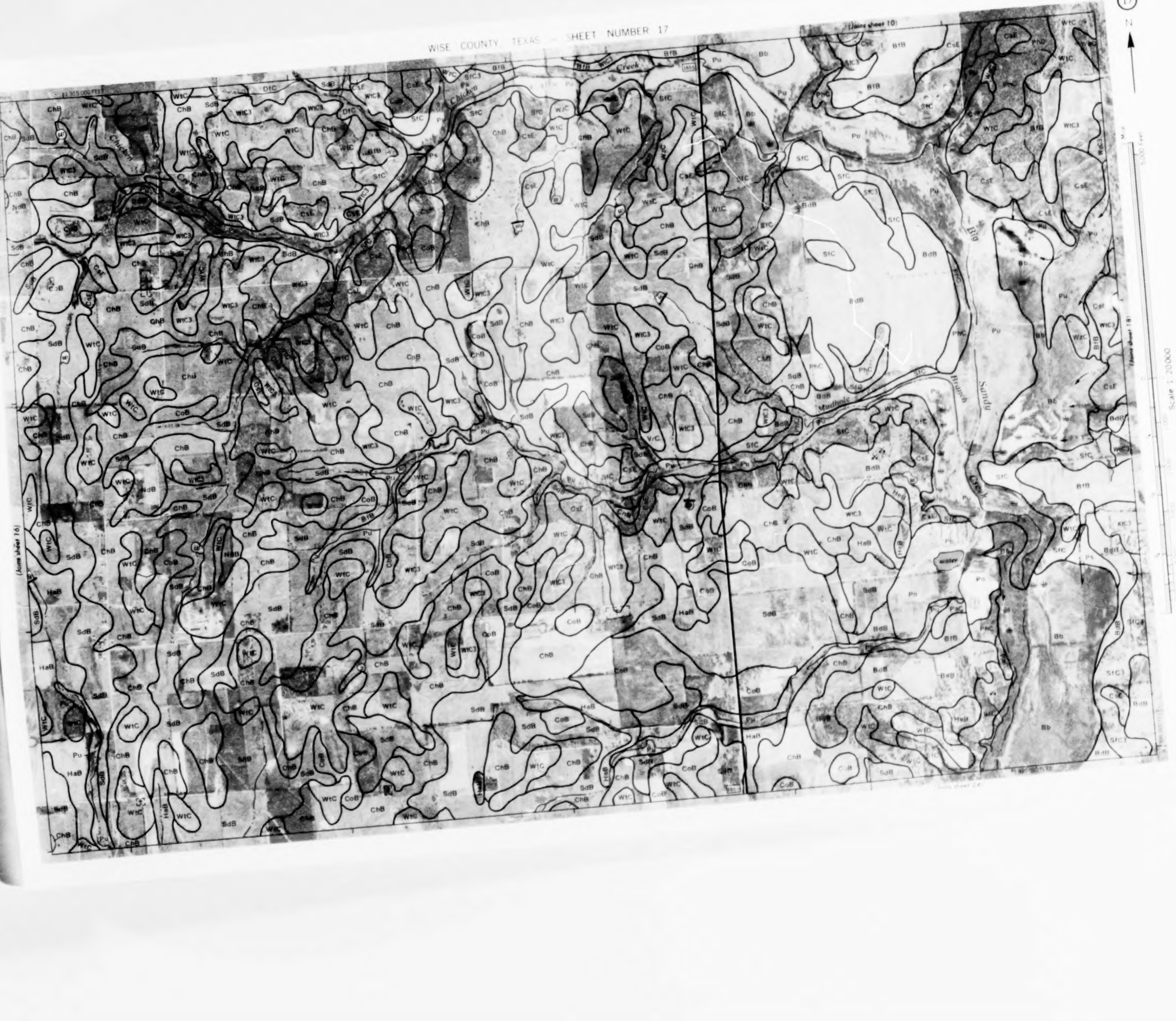

⑭
N
Scale 1:20000
1 Mile
5000 Feet
(Joins sheet 7)
(Joins sheet 13)
(Joins sheet 21)
2 015 000 FEET
North Pecan Creek
Slidell
DENTON
SaC
SoC
SaD
MdE
SaB
PvB
BoB
BoC
ByE
VeC
SbB
Fr


N
Scale 1:20000
5000 Feet
1 Mile
JACK
COUNTY
BOUNDARY
Elm
Creek
Big
Creek
Elm Creek
CsE
ChB
SdB
WtC
WtC3
HaB
CoB
Pu
Ps
TuC
TuB
ThB
OwE
BtC
BtB
PaC
SeE
LnE
NdB
DaE
BxC
Bb
CsE
114

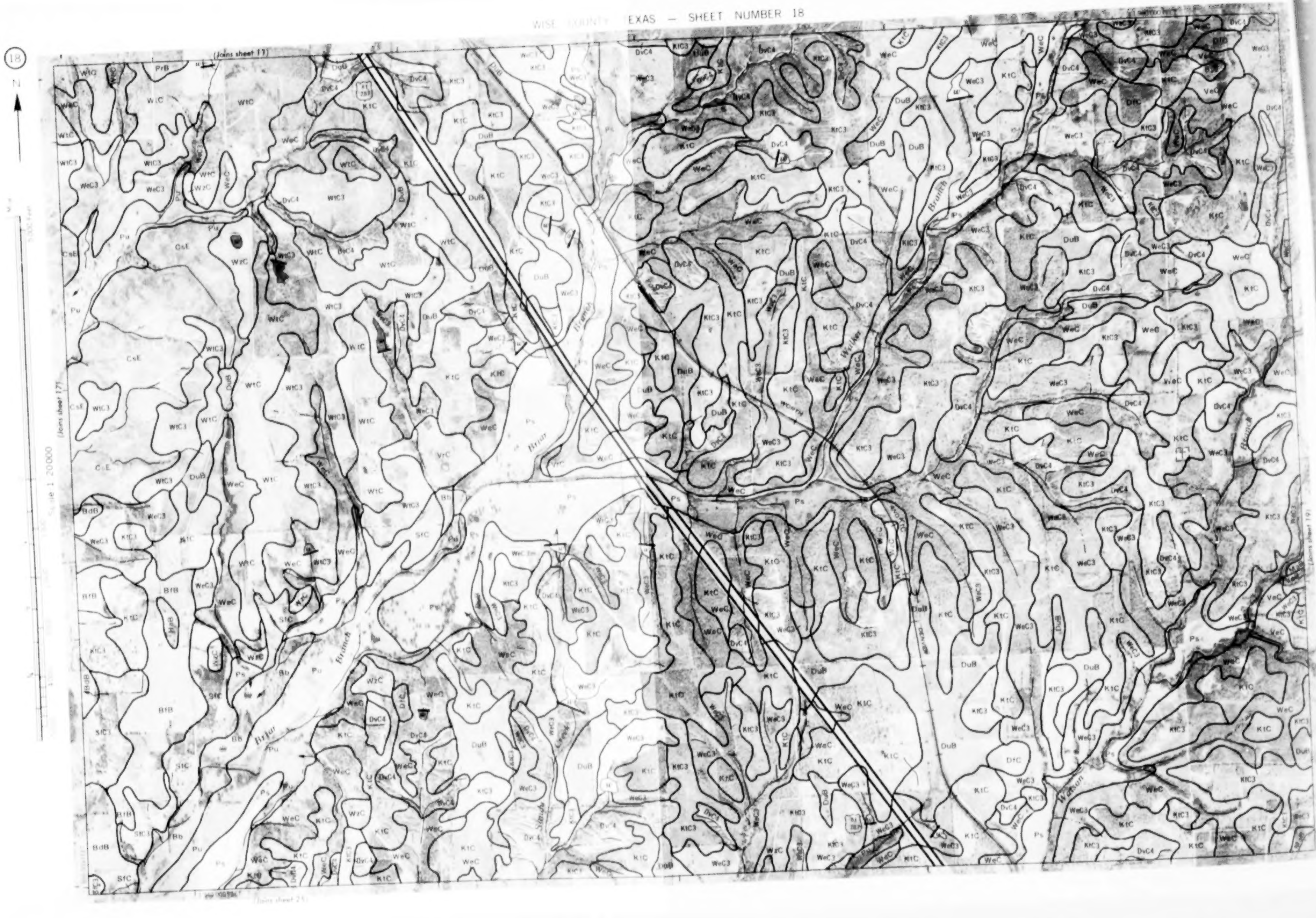
WISE COUNTY, TEXAS — SHEET NUMBER 16


16
N
Scale 1:20000
(Joins sheet 9)
(Joins sheet 15)
(Joins sheet 17)
(Joins sheet 23)
Gan Hollow
Doe
Venchoing
Dry Creek

WISE COUNTY, TEXAS — SHEET NUMBER 17

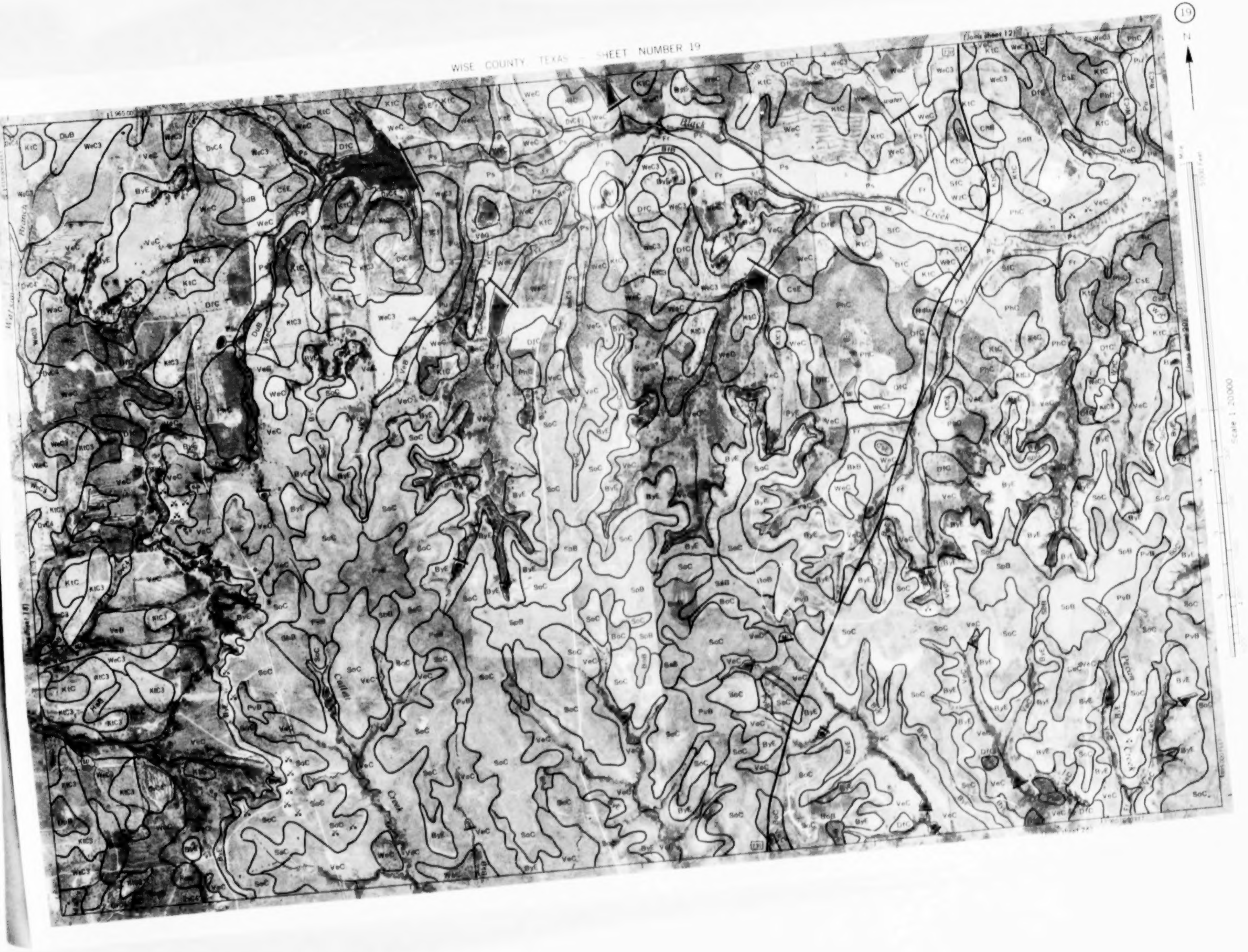

(Joins sheet 10)
(Joins sheet 16)
(Joins sheet 18)
(Joins sheet 24)
N
Scale 1:20 000
1 Mile
5000 Feet
Chicken Creek
Big Sandy Creek
Mudhole Branch
1655
water
ChB
SdB
WtC
WtC3
CoB
CsE
SfC
SfC3
BfB
BdB
Bb
Pu
Ps
Po
PhC
HaB
HeB
DtC
VrC

WISE COUNTY, TEXAS — SHEET NUMBER 18

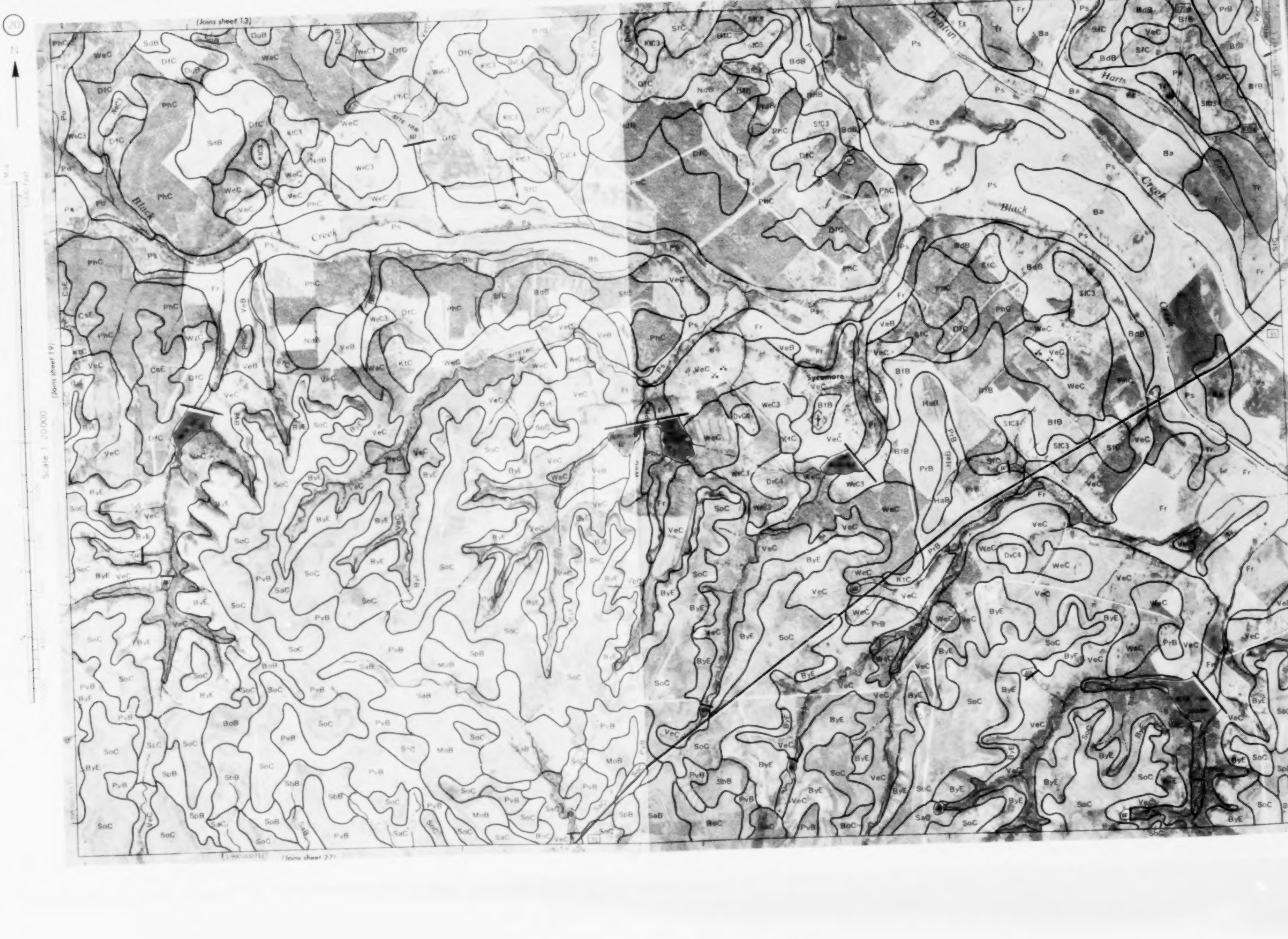

18
N
Scale 1:20000
(Joins sheet 11)
(Joins sheet 17)
(Joins sheet 19)
(Joins sheet 21)
Briar Branch
Walker Branch
Watson Branch
Stanch Creek
Briar

(19)

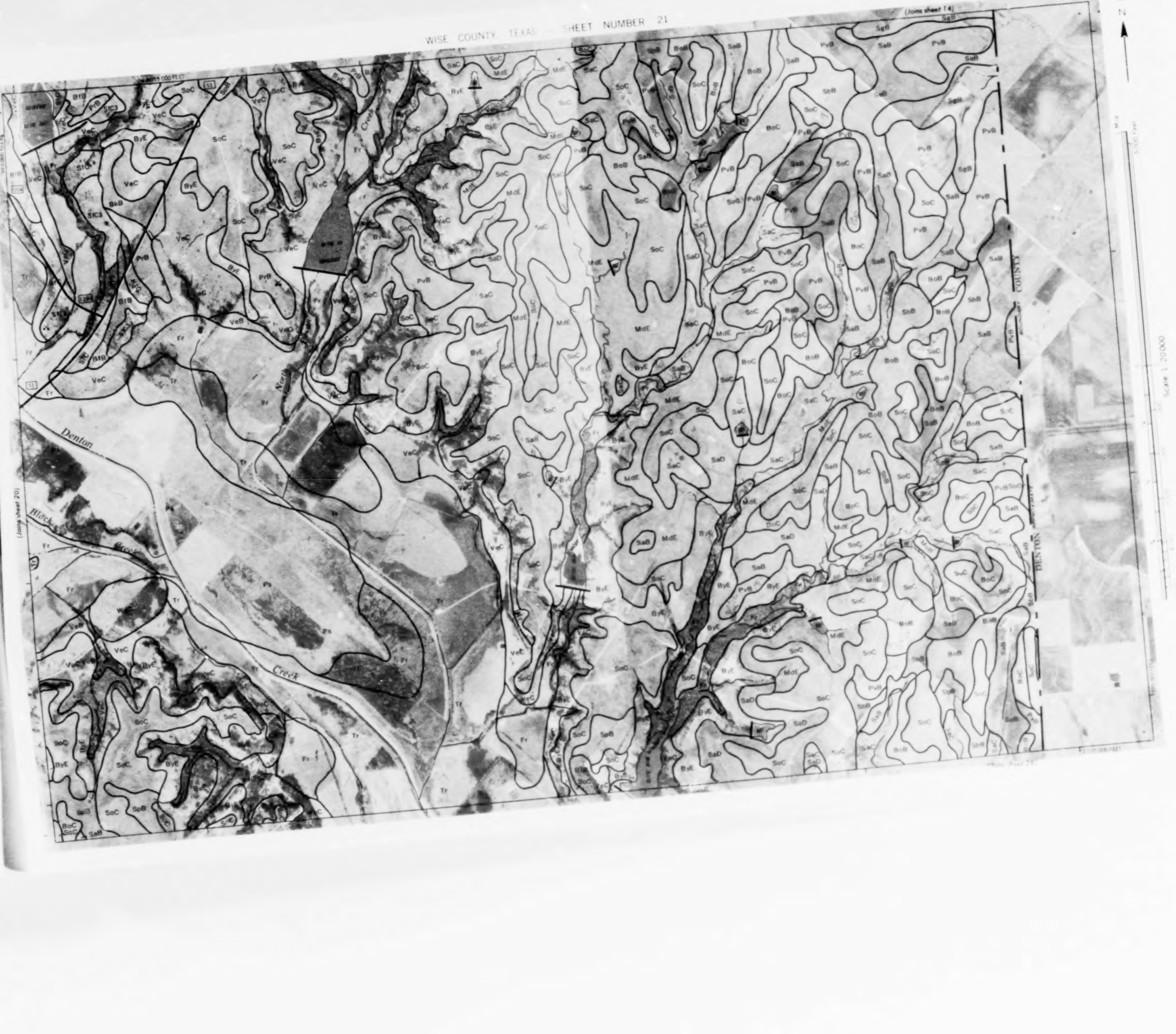
WISE COUNTY, TEXAS — SHEET NUMBER 19


N
Scale 1:20 000
5000 Feet
Mile
(Joins sheet 12)
(Joins sheet 20)
1 965 000 FEET
Black Creek
Catlett Creek
Pecan Creek
Watson Branch
KtC
KtC3
DuB
DvC4
WeC
WeC3
VeC
ByE
SdB
CsE
DfC
Ps
Fr
SoC
SpB
BoC
PvB
PhC
SfC
WzC
CrB
730
287

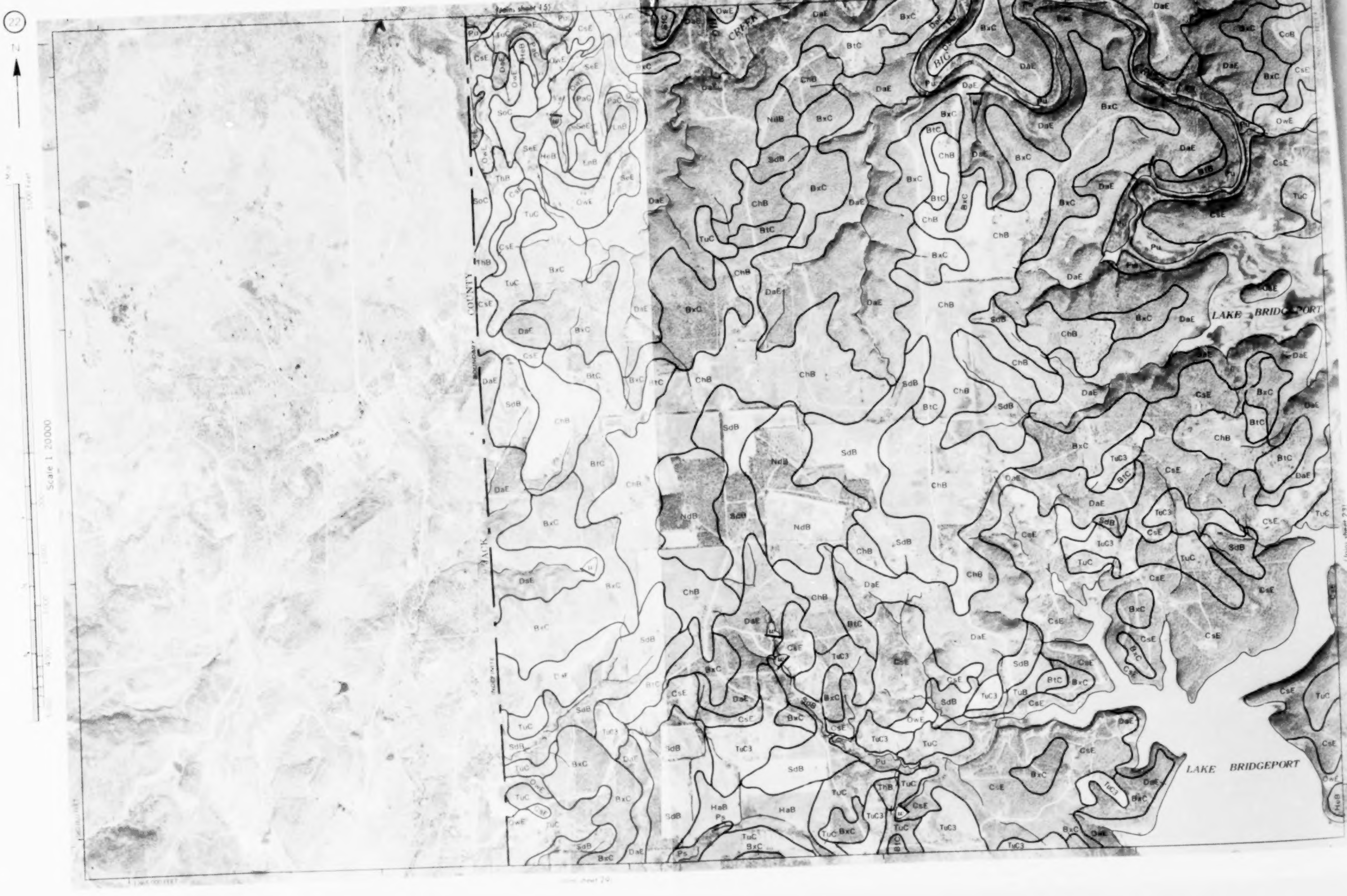
WISE COUNTY, TEXAS — SHEET NUMBER 20


20
N
(Joins sheet 13)
(Joins sheet 19)
(Joins sheet 21)
(Joins sheet 27)
Scale 1:20000
Black Creek
Harts Creek
Denton Creek
Sycamore

WISE COUNTY, TEXAS — SHEET NUMBER 21

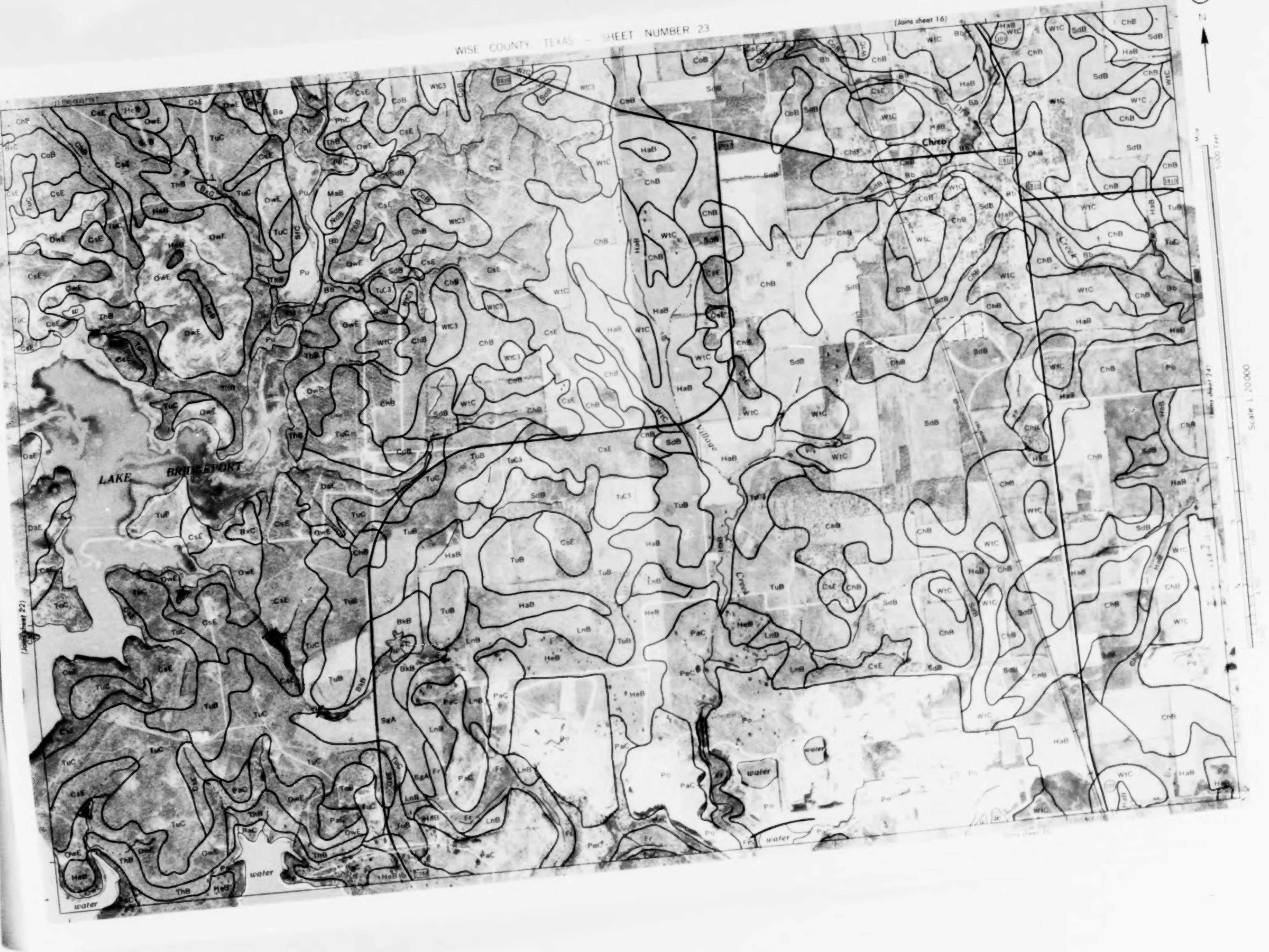

(Joins sheet 14)
(Joins sheet 20)
N
Scale 1:20 000
1 Mile
5000 Feet
Denton
Creek
Black
Creek
North
Creek
DENTON
COUNTY
SoC
SaB
SaC
SaD
BoB
BoC
PvB
MdE
ByE
VeC
VeB
Fr
Tr
Ps
BfB
BkB
PrB
SgB
SbB
StC3

WISE COUNTY, TEXAS — SHEET NUMBER 22



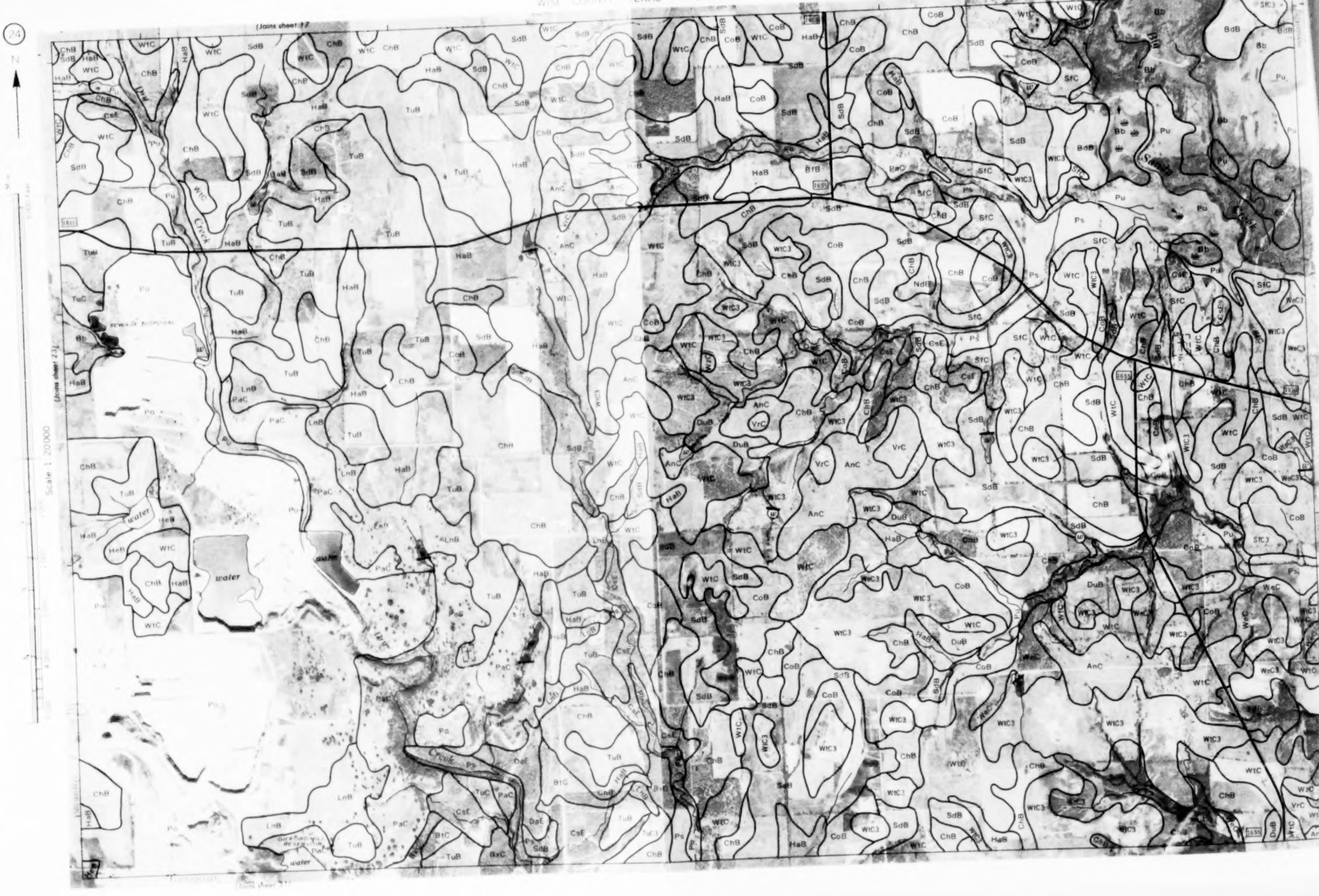
22
N
Scale 1:20000
(Joins sheet 15)
(Joins sheet 23)
(Joins sheet 29)
JACK COUNTY
BIG CREEK
LAKE BRIDGEPORT
LAKE BRIDGEPORT
DaE
BxC
BtC
ChB
CsE
SdB
NdB
TuC
TuC3
OwE
Pu
CoB
HaB
Ps
ThB
TuB
SeE
SoC
PaC
HeB
LnB

WISE COUNTY, TEXAS — SHEET NUMBER 23

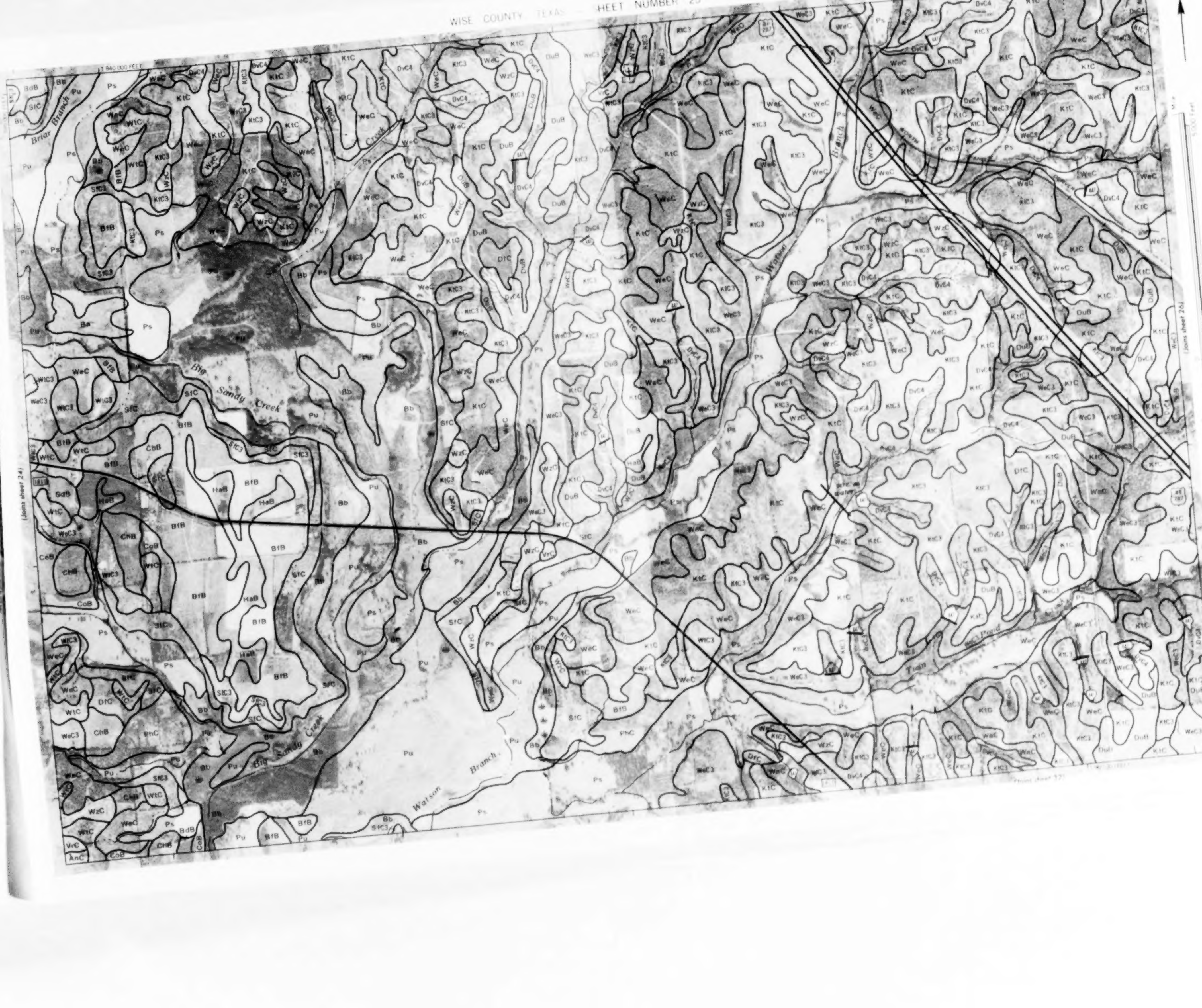

(Joins sheet 16)
N
LAKE BRIDGEPORT
Chico
Village Creek
Creek
water
(Joins sheet 22)
(Joins sheet 24)
Scale 1:20 000
5000 Feet
1 Mile
ChB
CsE
OwE
TuC
ThB
HaB
CoB
WtC
WtC3
SdB
Bb
Pu
MaB
PhC
BxC
TuB
TuC3
DaE
HeB
LnB
PaC
Po
Fr
BkB
SgA
Ba

㉔

WISE COUNTY, TEXAS — SHEET NUMBER 24

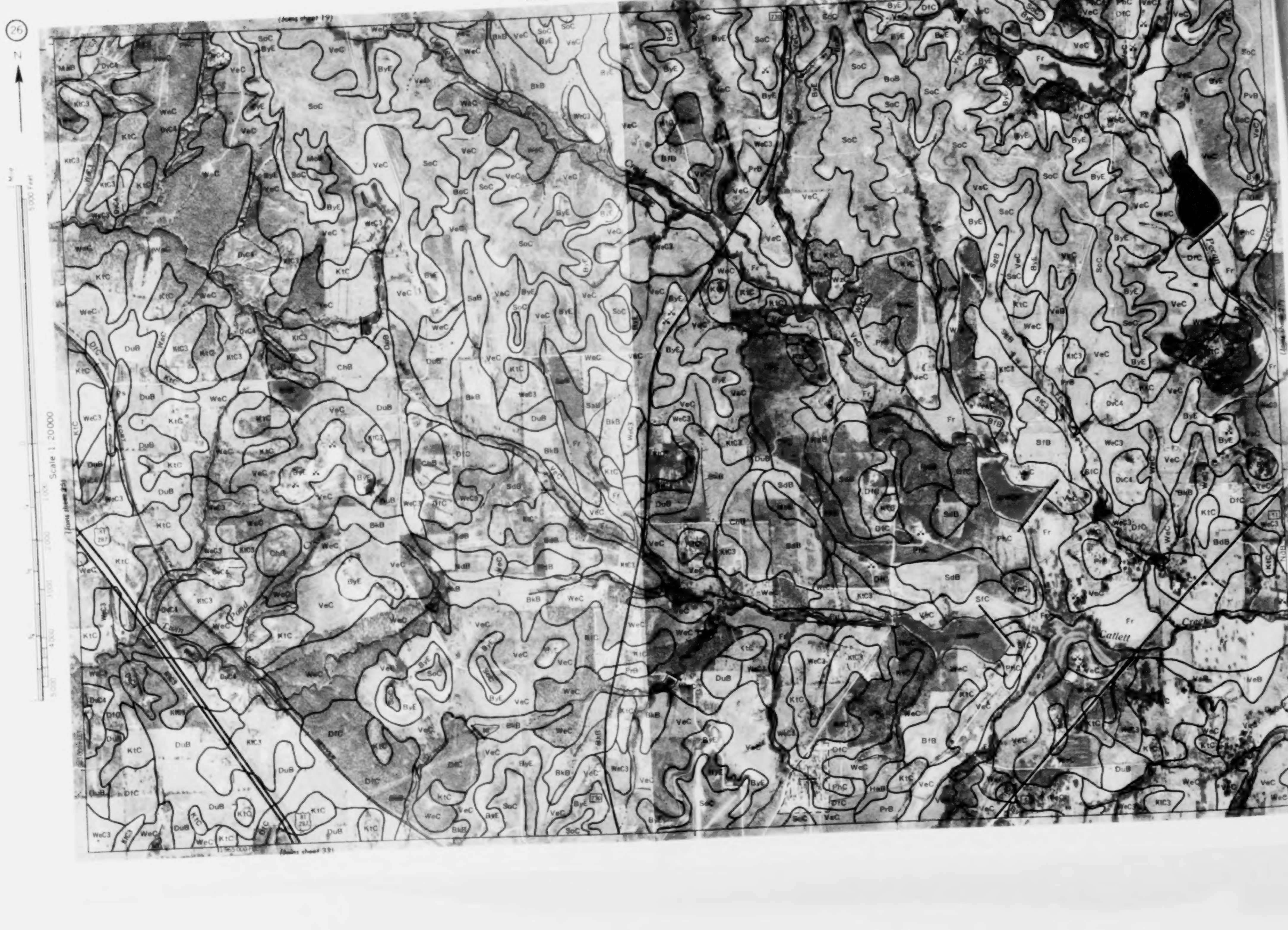

N
Scale 1:20000
(Joins sheet 17)
(Joins sheet 23)
(Joins sheet 25)
(Joins sheet 31)
Creek
water
SEWAGE DISPOSAL
ChB
WtC
SdB
HaB
TuB
CoB
Pu
Ps
SfC
Bb
BdB
CsE
AnC
WtC3
DuB
VrC
PaC
LnB
Po
WeC
1655
1810

WISE COUNTY, TEXAS — SHEET NUMBER 25

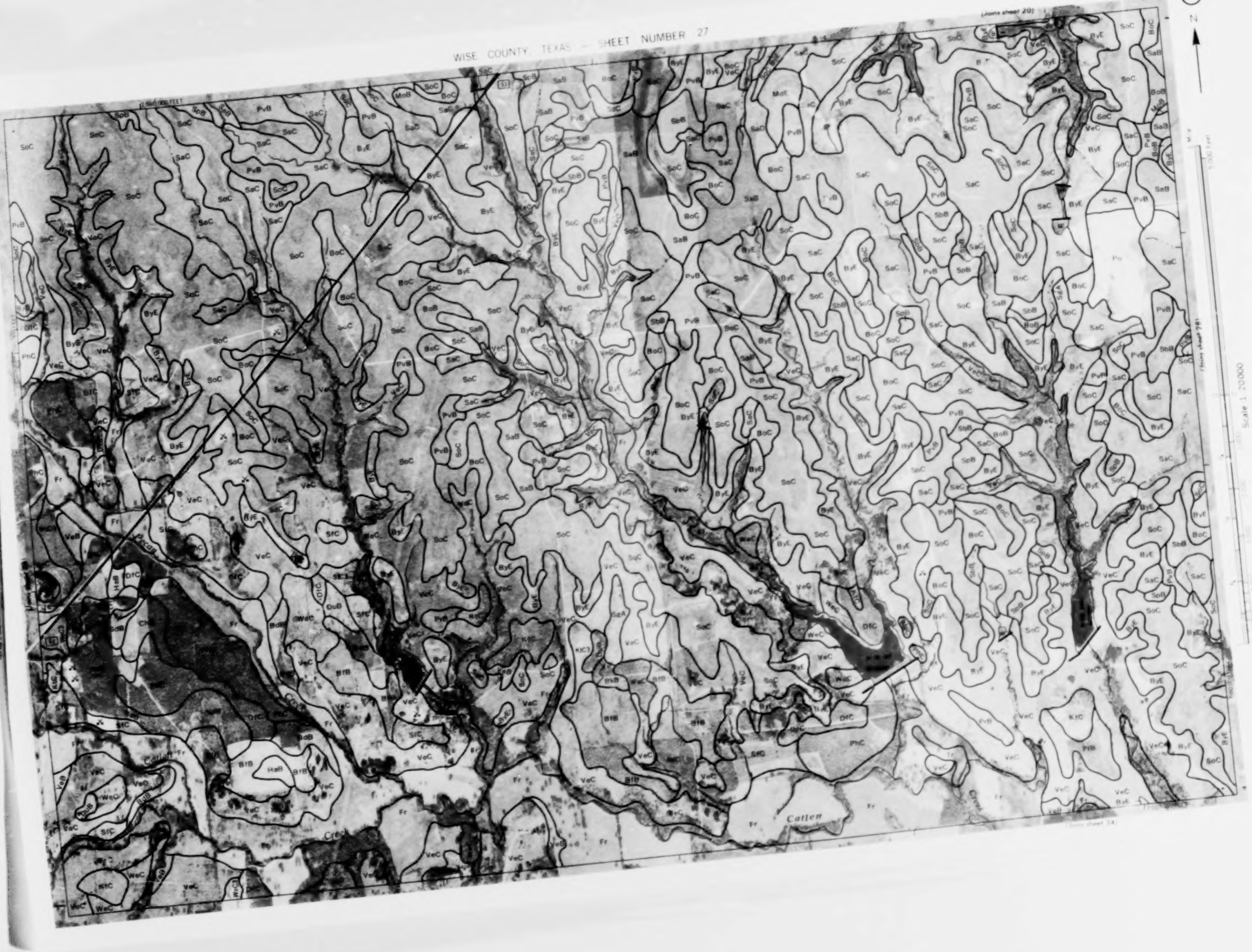


N
(Joins sheet 18)
(Joins sheet 20)
(Joins sheet 24)
(Joins sheet 27)
Scale 1:20000
1 940 000 FEET
5000 Feet
Briar Branch
Big Sandy Creek
Big Sandy Creek
Creek
Watson Branch
Watson Branch
Twin Pond
287
Ps
Pu
Bb
BfB
StC
StC3
WeC
WeC3
WtC
WtC3
WzC
KtC
KtC3
DvC4
DuB
DfC
HaB
ChB
CoB
SdB
BdB
PhC
VrC
AnC
MaB

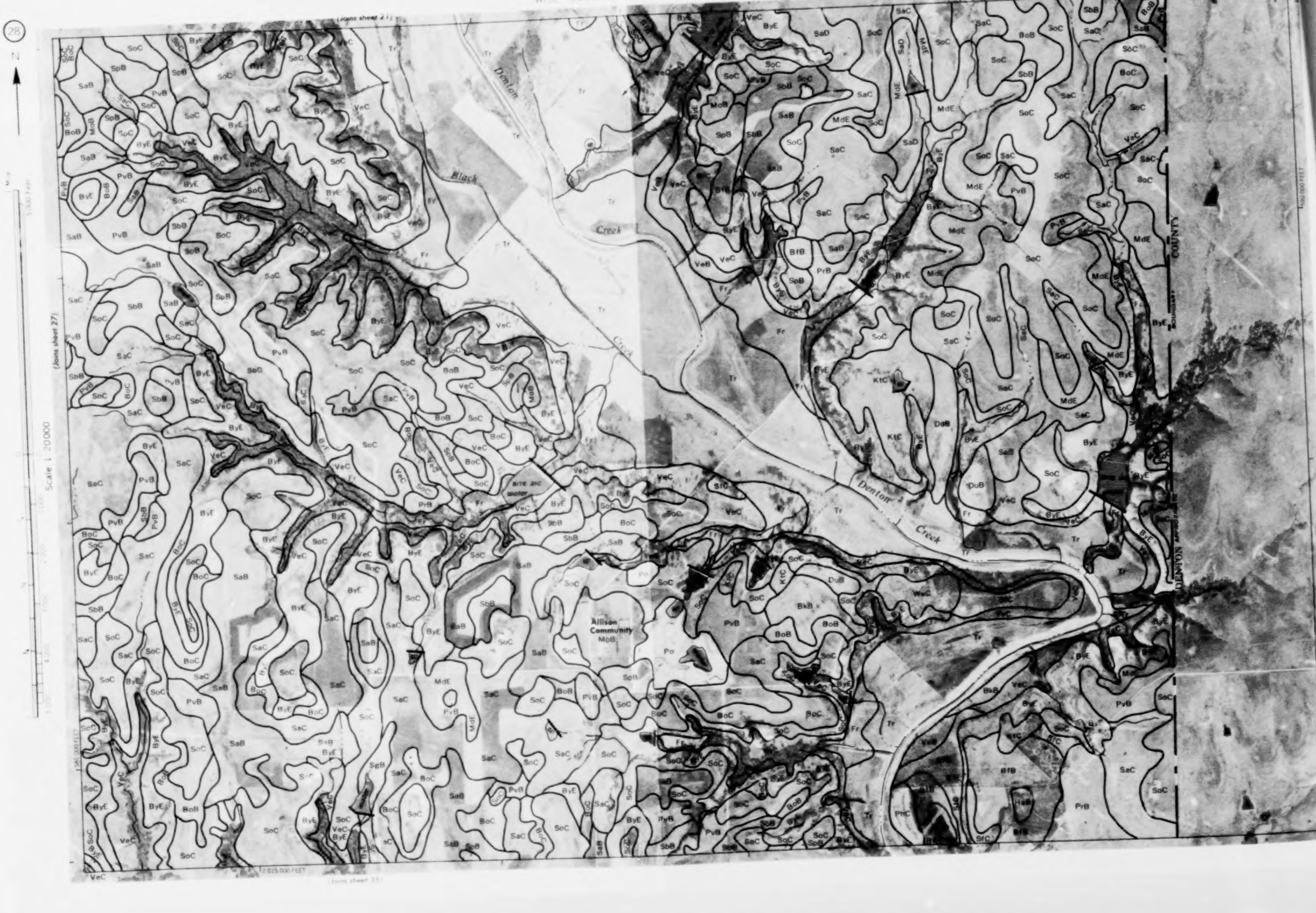
WISE COUNTY, TEXAS — SHEET NUMBER 26


㉖
N
(Joins sheet 19)
(Joins sheet 25)
(Joins sheet 27)
(Joins sheet 39)
Scale 1:20000
1 Mile
5000 Feet
Town Creek
Catlett Creek
287
81

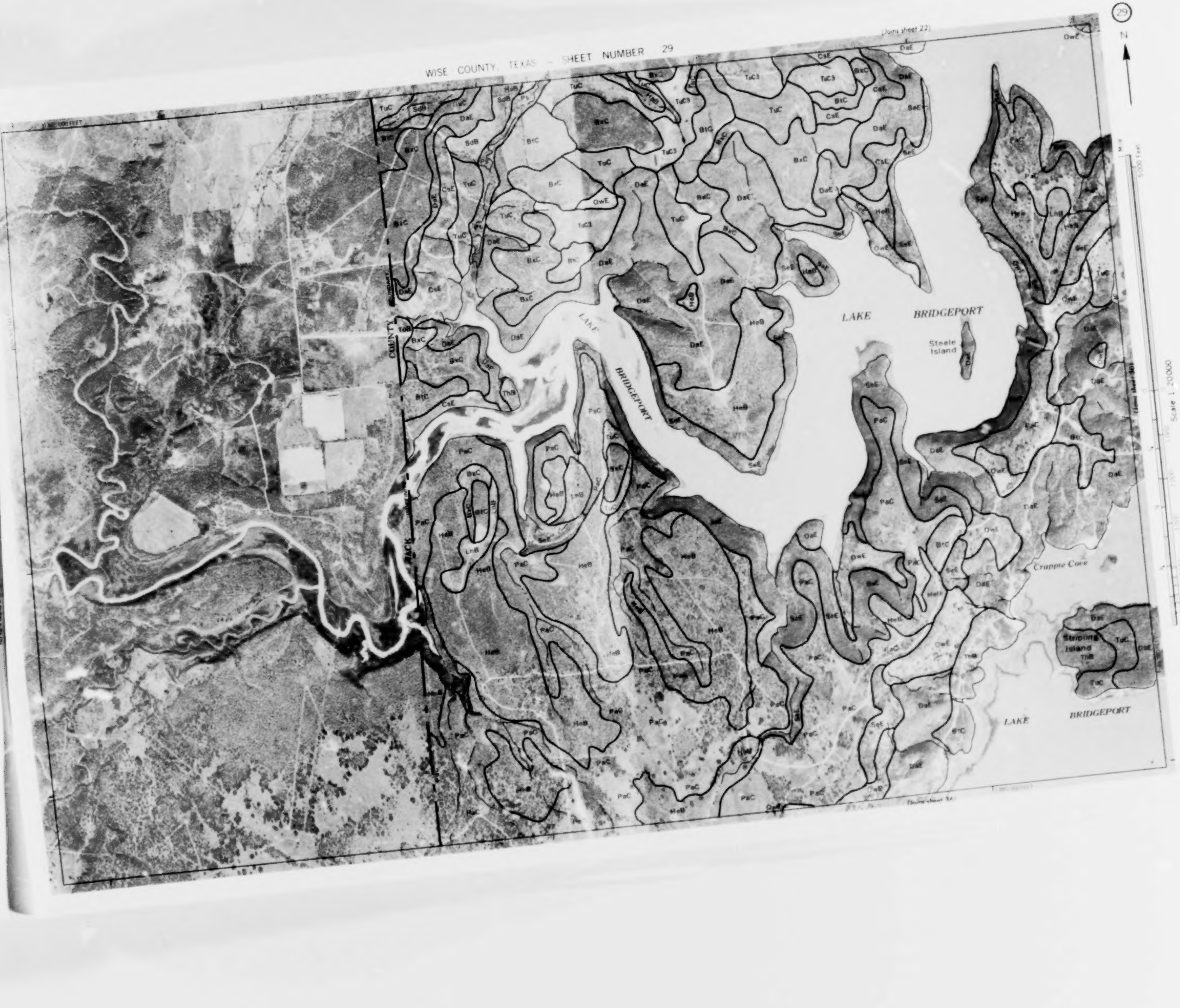
WISE COUNTY, TEXAS — SHEET NUMBER 27


㉗
N
(Joins sheet 20)
(Joins sheet 28)
(Joins sheet 34)
Scale 1:20000
1 Mile
5000 Feet
Catlett Creek
Catlett
Creek

WISE COUNTY, TEXAS — SHEET NUMBER 28

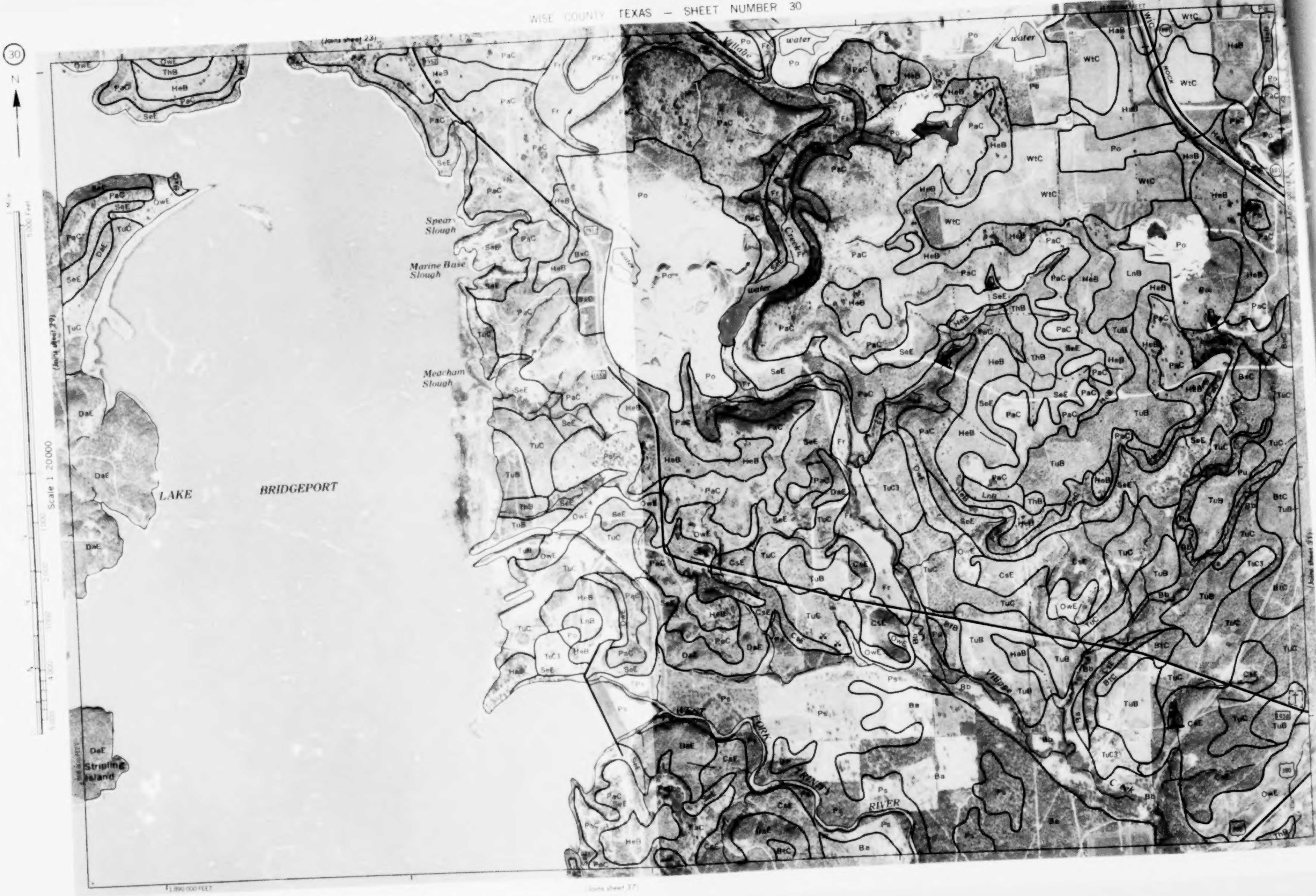

28
N
(Joins sheet 21)
(Joins sheet 27)
(Joins sheet 35)
Scale 1:20000
2 035 000 FEET
2 025 000 FEET
Black Creek
Denton Creek
Denton Creek
Allison Community
MdB
DENTON COUNTY
SoC
SaC
SaB
PvB
ByE
VeC
BoC
BoB
SbB
MdE
Fr
Tr
Po

WISE COUNTY, TEXAS — SHEET NUMBER 29

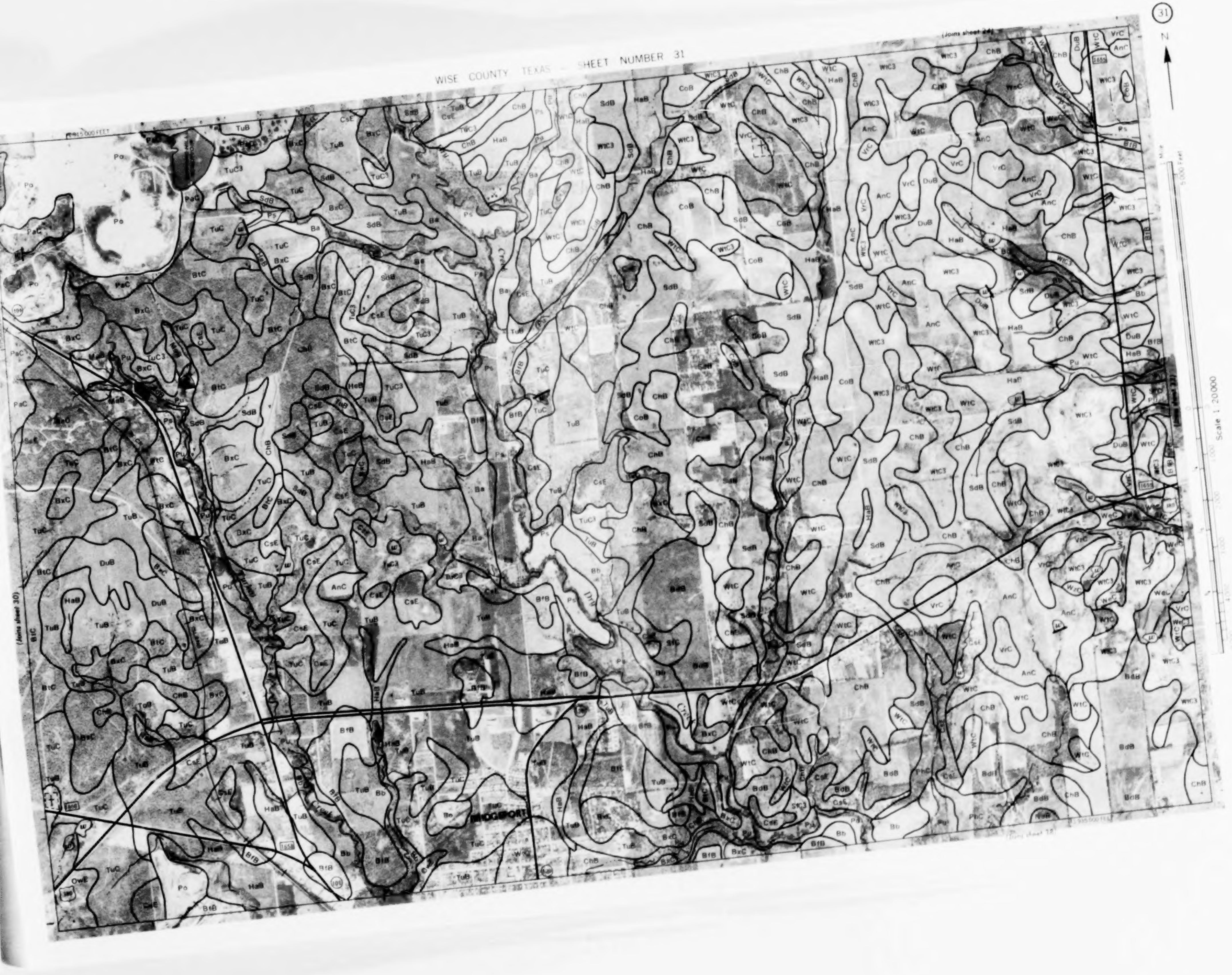


29
N
(Joins sheet 22)
(Joins sheet 34)
Scale 1:20 000
1 Mile
5000 Feet
COUNTY
JACK
LAKE BRIDGEPORT
LAKE
BRIDGEPORT
Steele Island
Crappie Cove
Stripling Island
TuC
TuC3
SdB
BxC
BtC
CsE
DaE
OwE
SeE
HeB
LnB
PaC
ThB
Ps

WISE COUNTY TEXAS — SHEET NUMBER 30

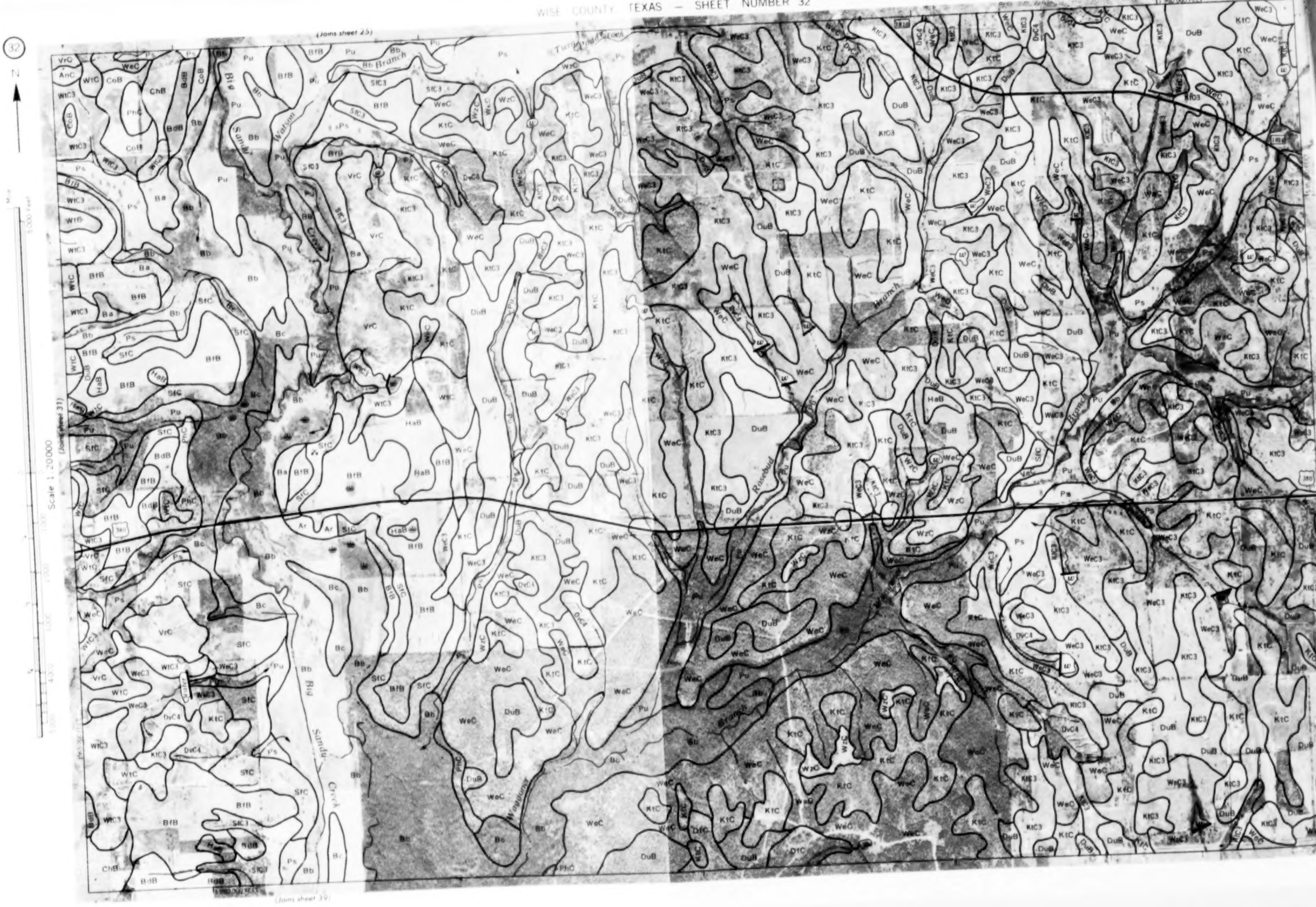

30
N
(Joins sheet 23)
(Joins sheet 29)
(Joins sheet 31)
(Joins sheet 37)
Scale 1:20000
5000 Feet
1 890 000 FEET
LAKE
BRIDGEPORT
Spear Slough
Marine Base Slough
Meacham Slough
Stripling Island
Village Creek
water
WEST FORK TRINITY RIVER
ROCK
Village Creek
PaC
HeB
SeE
OwE
ThB
DaE
TuC
TuB
TuC3
Po
Ps
Fr
WtC
LnB
BsC
BtC
CsE
Bb
Ba
Pu

WISE COUNTY TEXAS — SHEET NUMBER 31

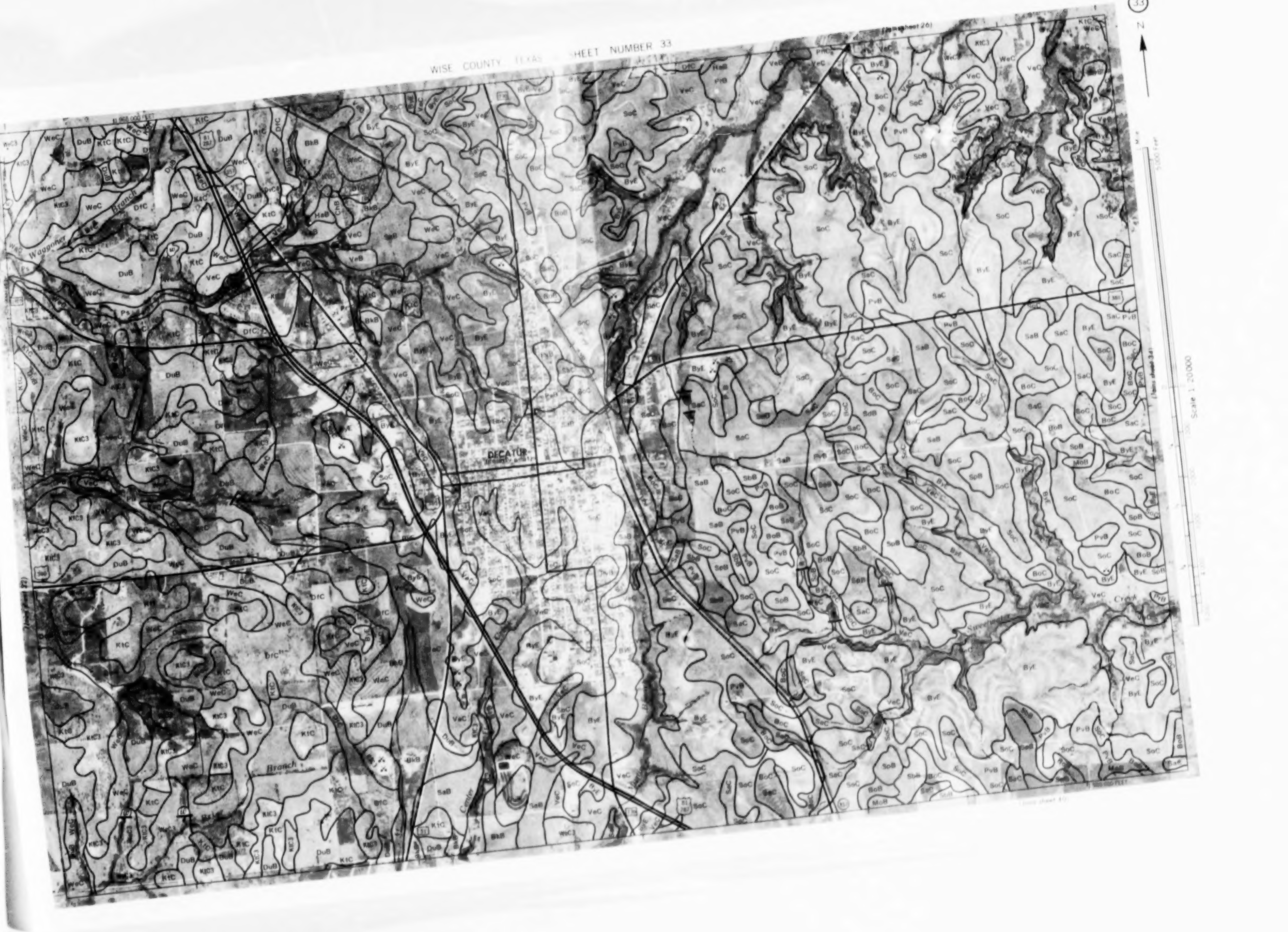


31
N
(Joins sheet 24)
(Joins sheet 30)
(Joins sheet 38)
(Joins sheet 32)
2 315 000 FEET
1 Mile
5000 Feet
Scale 1:20 000
BRIDGEPORT
Creek
1655
1658
380
101
PaC
Po
TuB
TuC
TuC3
BxC
BtC
SdB
CsE
HaB
ChB
WtC
WtC3
VrC
AnC
DuB
CoB
BfB
Ps
Pu
Ba
Bb
BdB
PhC
OwE
WeC
StC

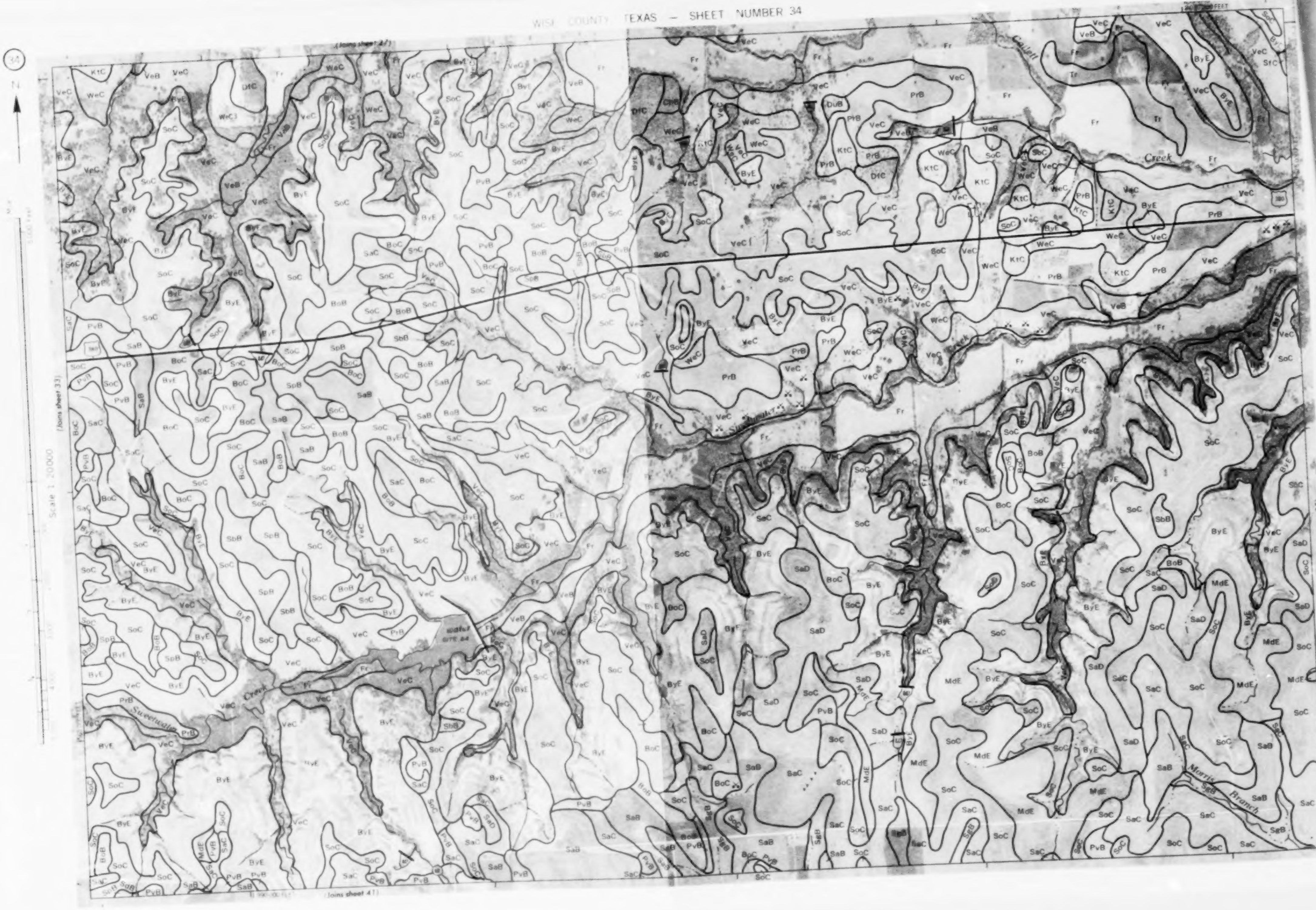
WISE COUNTY, TEXAS — SHEET NUMBER 32

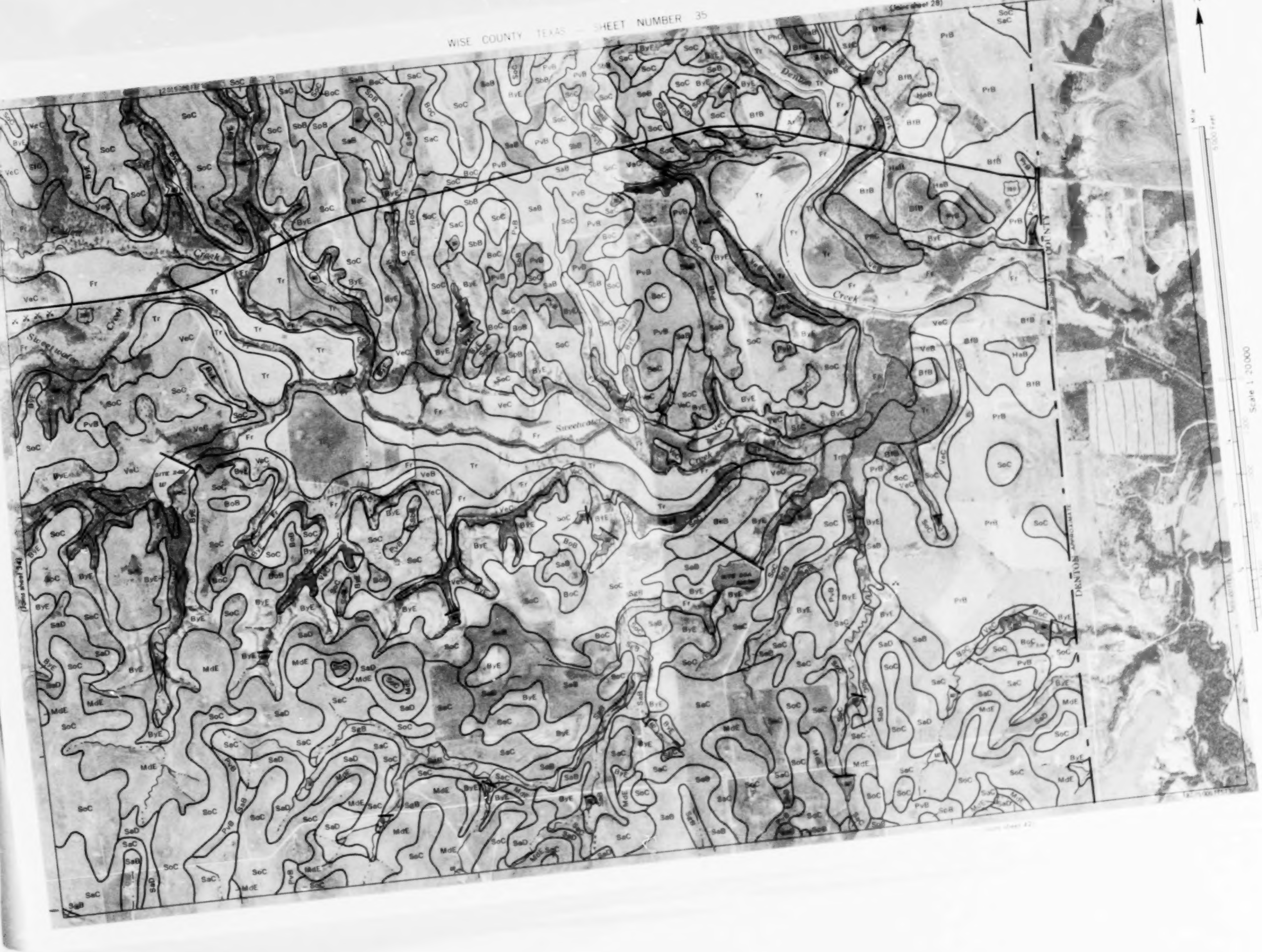

32
N
Scale 1:20 000
(Joins sheet 25)
(Joins sheet 31)
(Joins sheet 39)
Big Sandy Creek
Watson Branch
Turkey Creek
Rosebud
Branch
Waggoner Branch
380

WISE COUNTY, TEXAS — SHEET NUMBER 33

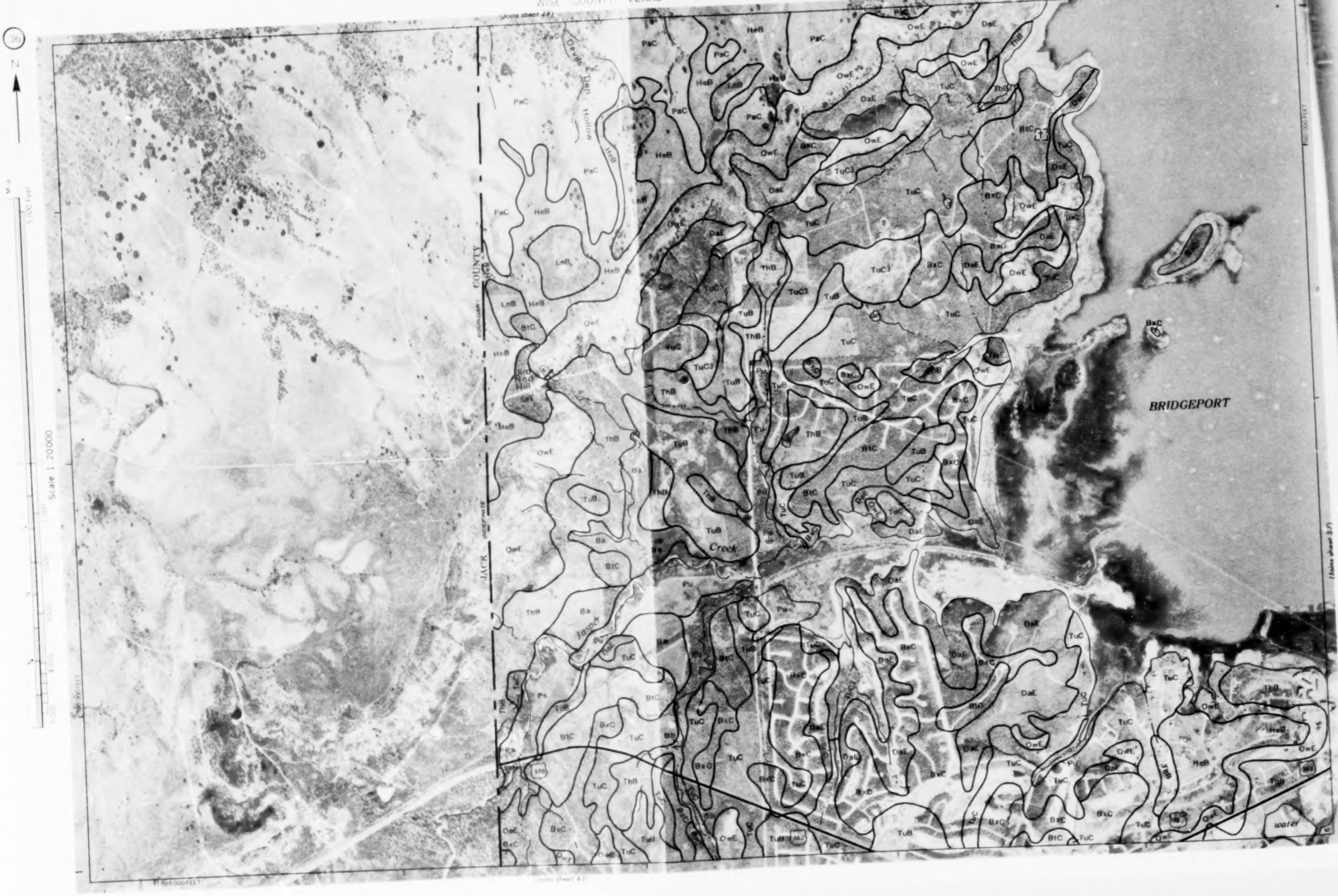

(Joins sheet 26)
(Joins sheet 34)
(Joins sheet 40)
DECATUR
Waggoner Branch
Branch
Sweetwater Creek
Center
Scale 1:20 000
1 Mile
5000 Feet
N
KtC
KtC3
WeC
DuB
DfC
BkB
VeC
ByE
SoC
SaC
SaB
SbB
SpB
PvB
BoC
BoB
MoB
HaB
Ps
Fr

WISE COUNTY, TEXAS — SHEET NUMBER 34

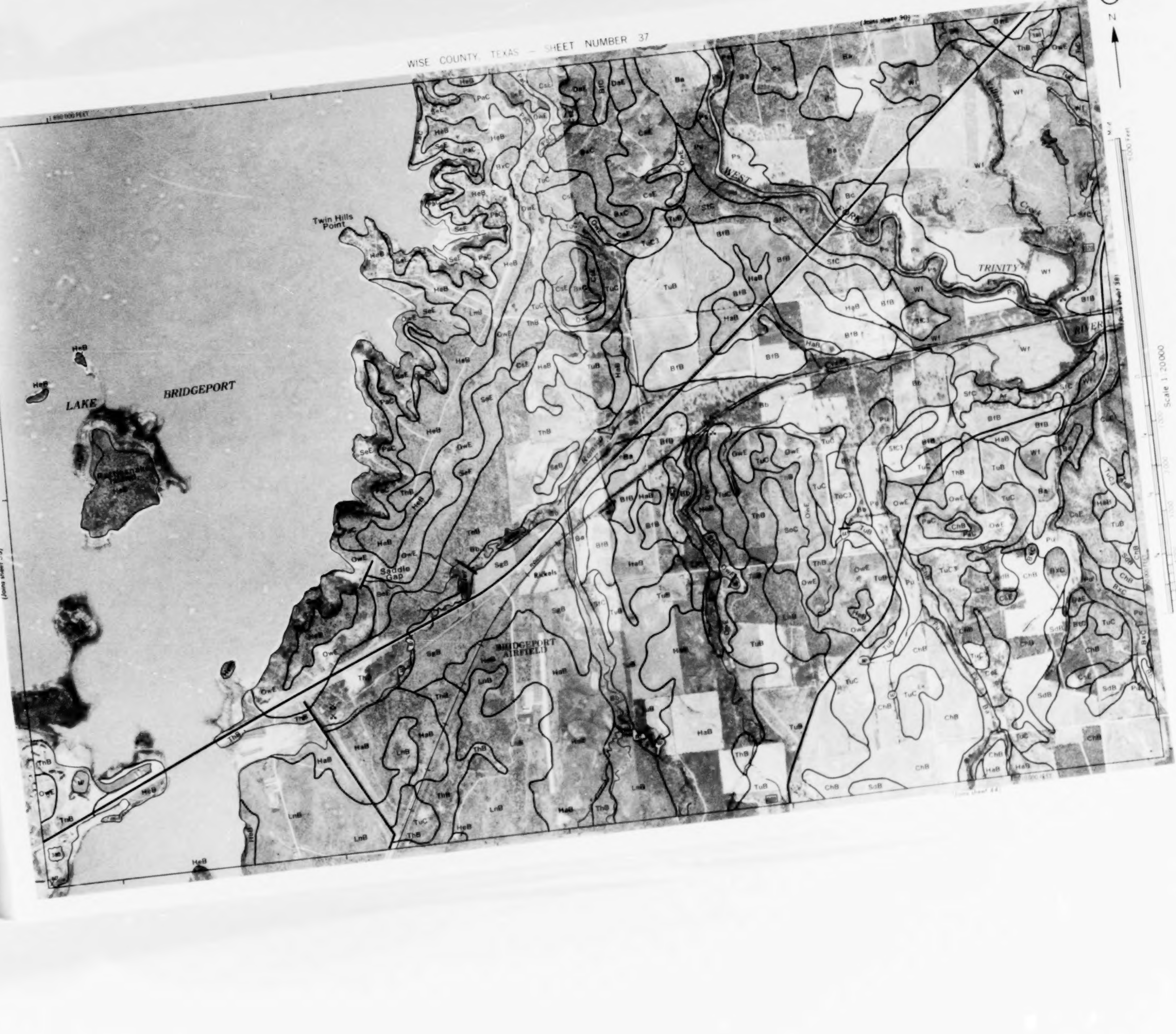

34
N
(Joins sheet 27)
(Joins sheet 33)
(Joins sheet 35)
(Joins sheet 41)
Scale 1:20000
1 Mile
5000 Feet
Sweetwater Creek
Garrett Creek
Morris Branch
Site 44


WISE COUNTY, TEXAS — SHEET NUMBER 35
(Joins sheet 28)
(Joins sheet 34)
(Joins sheet 42)
N
Scale 1:20 000
1 Mile
5000 Feet
DENTON COUNTY
Sweetwater Creek
Denton Creek
Sweetwater Creek
SITE 29A
SITE 30A
Fr
Tr
VeC
VeB
SoC
SaC
SaB
SaD
ByE
BoC
BoB
SbB
SpB
PvB
PrB
BfB
HaB
MdE
PhC
Ar

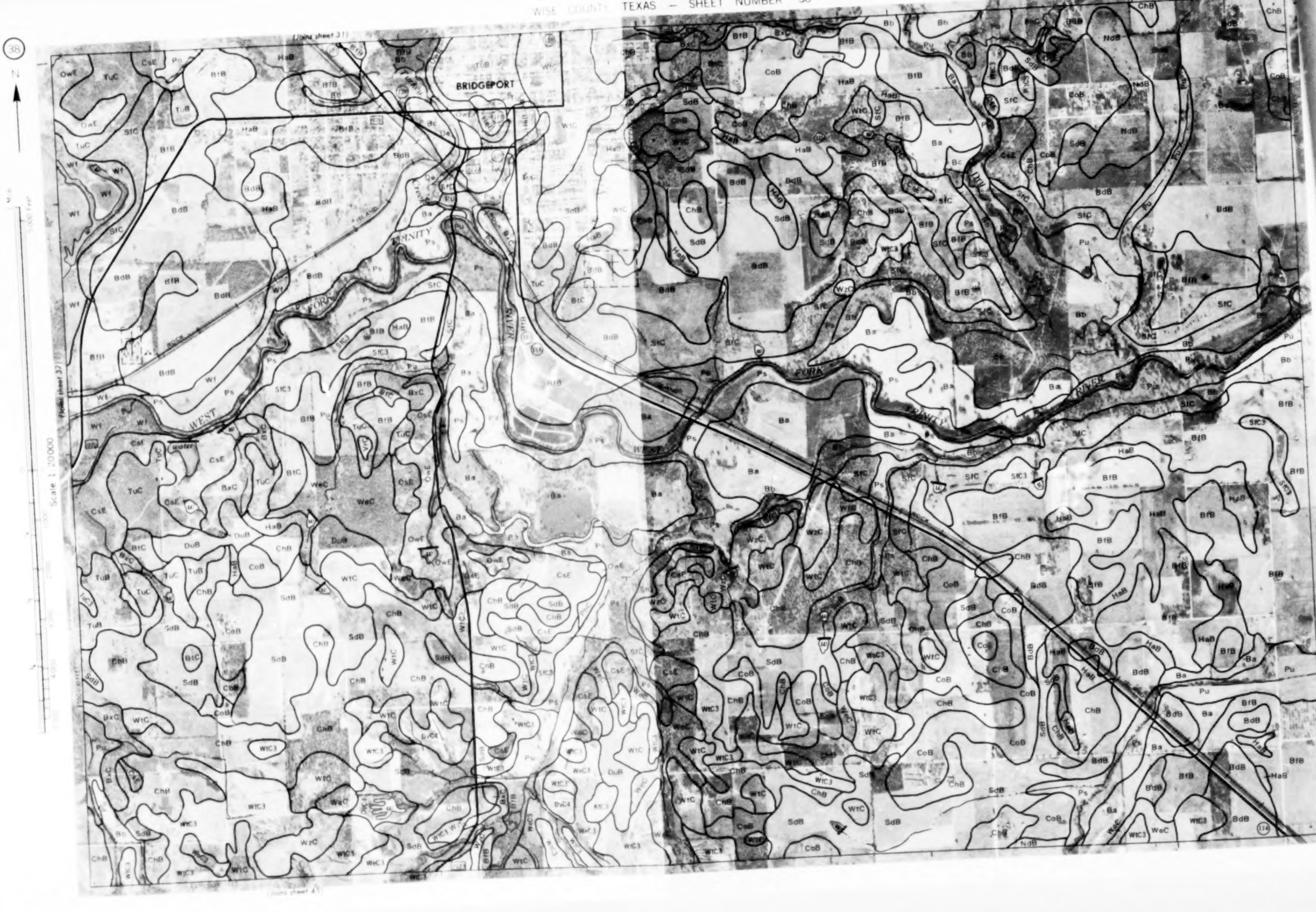
WISE COUNTY, TEXAS — SHEET NUMBER 36


36
N
Scale 1:20000
5000 Feet
1 Mile
(Joins sheet 29)
(Joins sheet 37)
(Joins sheet 43)
1 985 000 FEET
JACK COUNTY
BOUNDARY
Devils Den Hollow
Red Hill
Jasper
Creek
BRIDGEPORT
water
PaC
HeB
LnB
BtC
OwE
DaE
ThB
TuC
TuC3
TuB
BxC
Pu
Ba
Ps

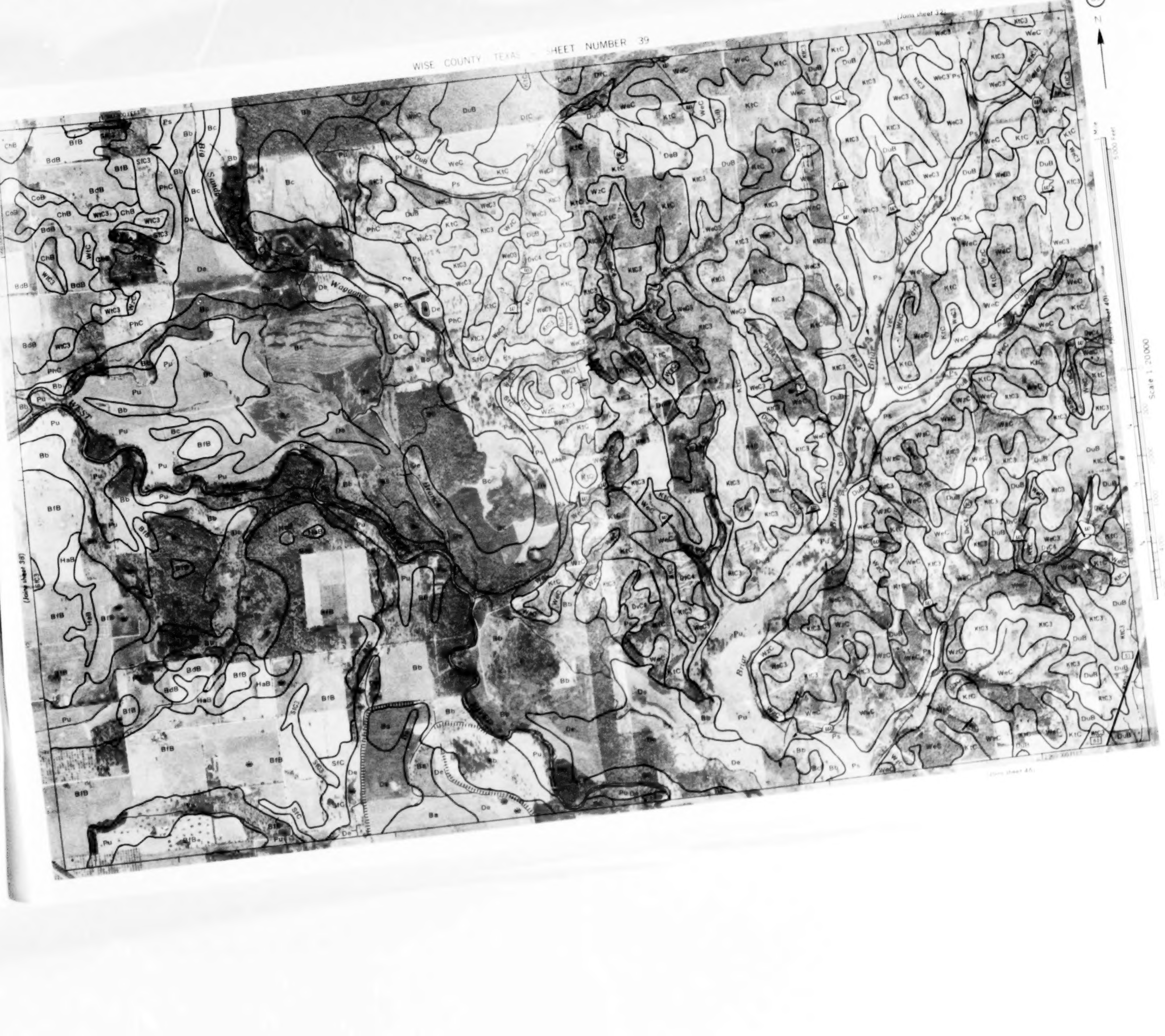
WISE COUNTY, TEXAS — SHEET NUMBER 37


N
(Joins sheet 30)
(Joins sheet 36)
(Joins sheet 38)
(Joins sheet 44)
1 890 000 FEET
Scale 1:20000
5000 Feet
Twin Hills Point
LAKE
BRIDGEPORT
Rattlesnake Island
Saddle Gap
BRIDGEPORT AIRFIELD
WEST
FORK
TRINITY
RIVER
Creek
Rickels
HeB
SeE
PaC
BxC
CsE
OwE
TuC
TuB
TuC3
ThB
SgB
HaB
LnB
BfB
Ba
Bb
Bc
Ps
Pu
StC
StC3
Wf
ChB
SdB
DaE
SoC
Lm

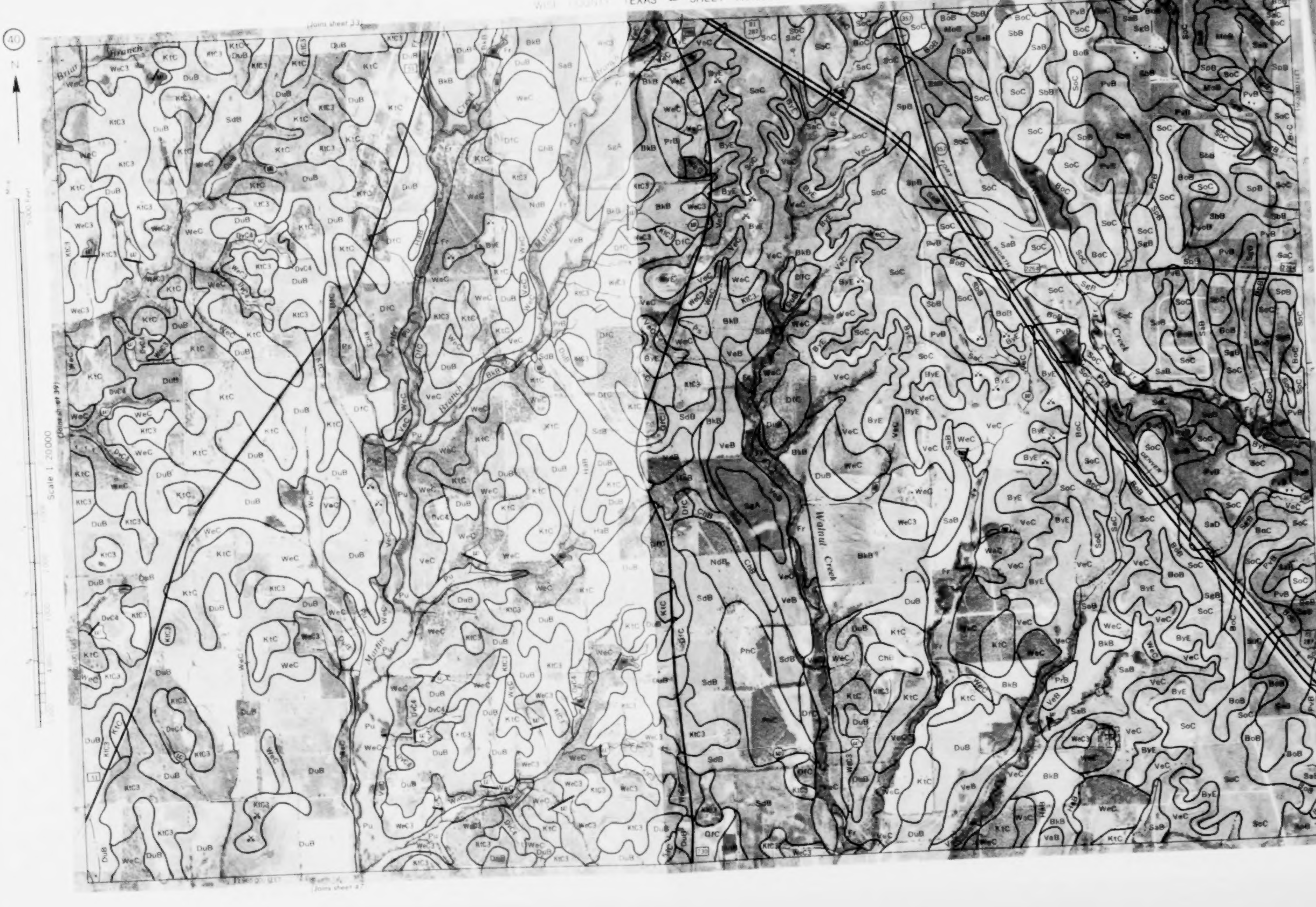
WISE COUNTY, TEXAS — SHEET NUMBER 38


N
Scale 1:20000
(Joins sheet 31)
(Joins sheet 37)
(Joins sheet 39)
(Joins sheet 45)
1 995 000 FEET
BRIDGEPORT
WEST FORK TRINITY RIVER
114

WISE COUNTY, TEXAS — SHEET NUMBER 39

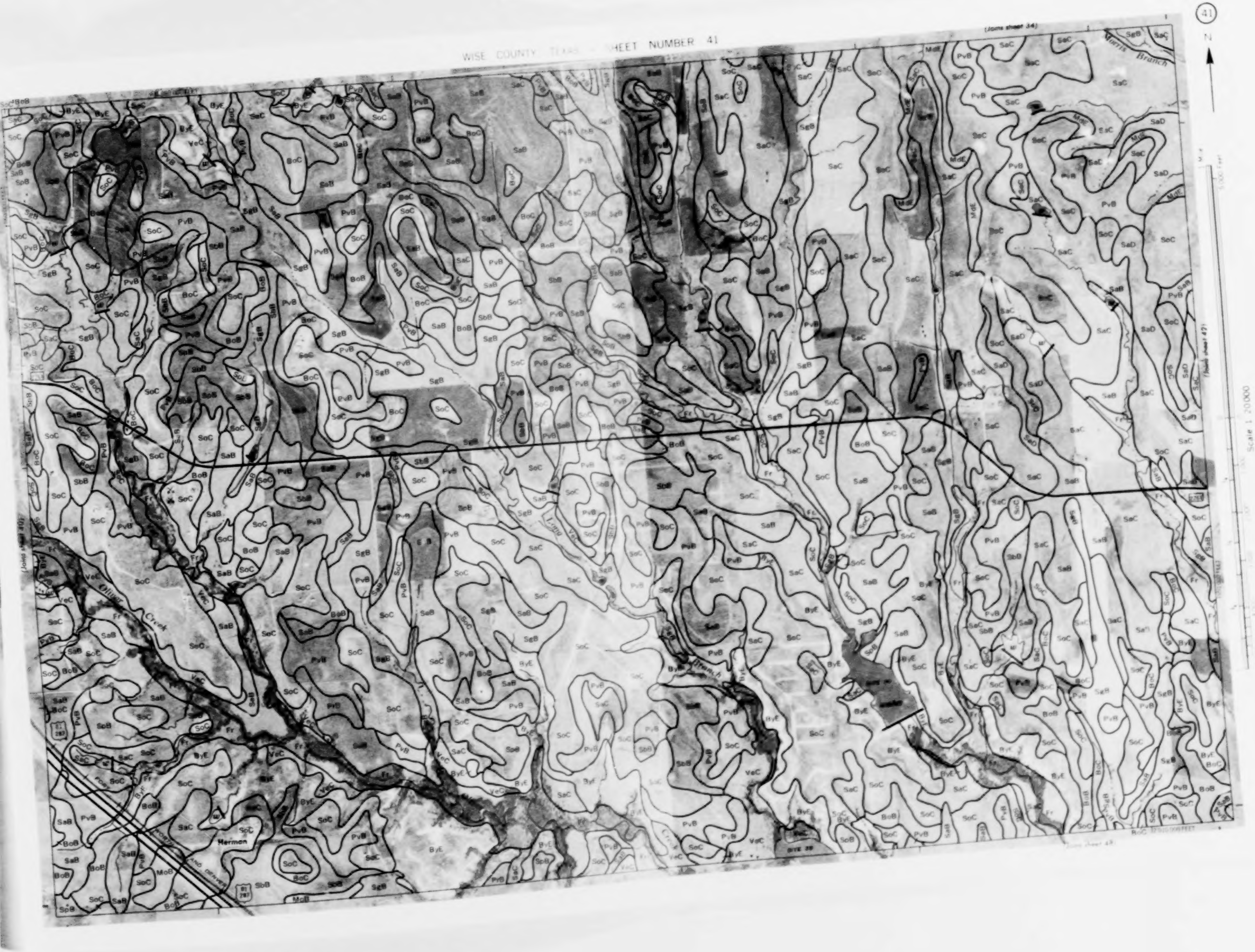

(Joins sheet 32)
(Joins sheet 38)
(Joins sheet 40)
(Joins sheet 46)
N
Scale 1:20000
5000 Feet
Big Sandy
Waggoner
West
Briar Branch
Briar
DuB
WeC
WeC3
KtC
KtC3
Ps
DtC
WzC
DvC4
Bb
Bc
Ba
BfB
BdB
ChB
CoB
WtC
WtC3
StC
StC3
PhC
Pu
De
HaB
51

WISE COUNTY, TEXAS — SHEET NUMBER 40

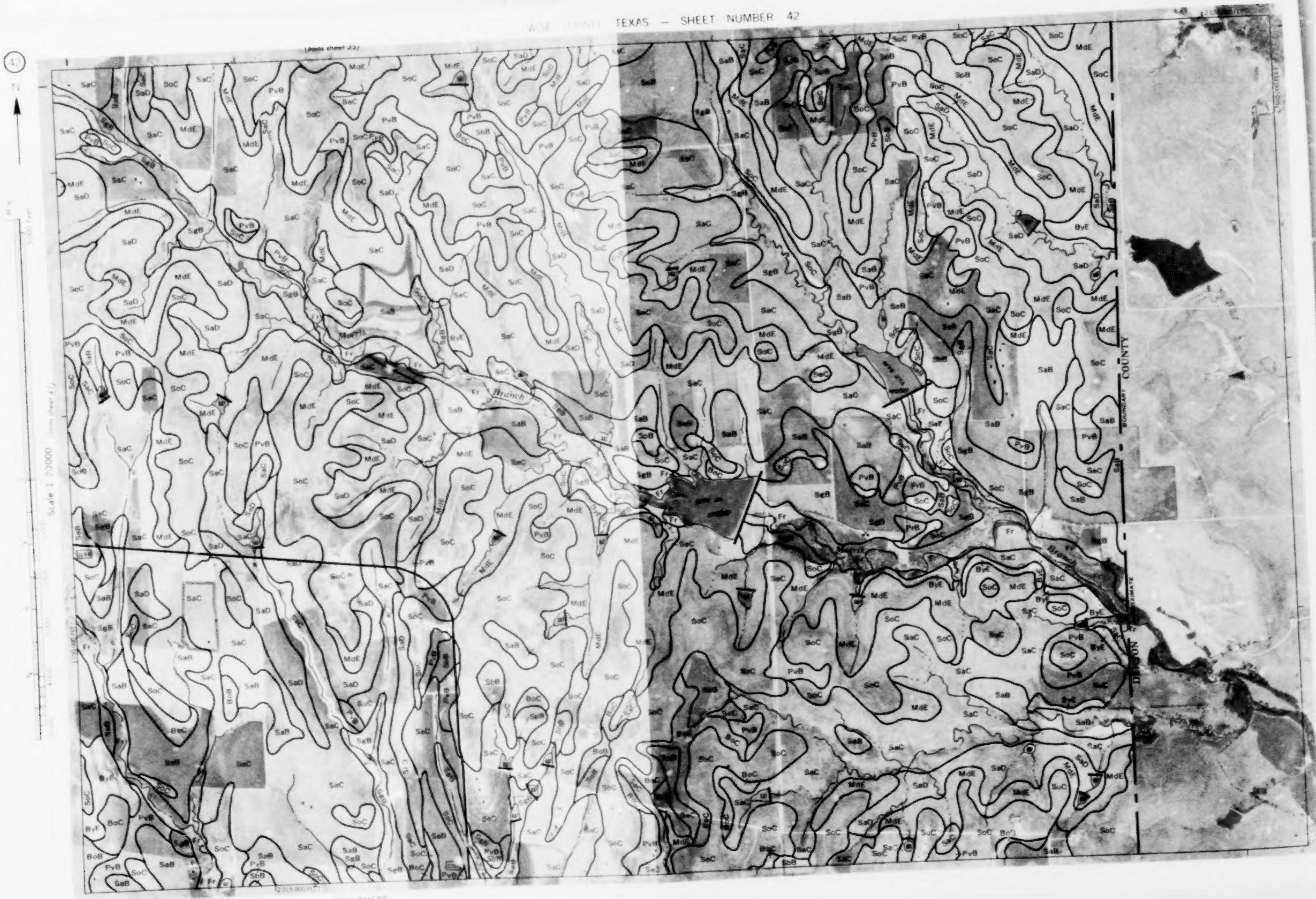

40
N
Scale 1:20 000
5000 Feet
(Joins sheet 33)
(Joins sheet 39)
(Joins sheet 47)
(Joins sheet 41)
1 985 000 FEET
Briar Branch
Carter Branch
Martin Branch
Walnut Creek
Creek
Fort Worth
Denver

(41)

WISE COUNTY, TEXAS — SHEET NUMBER 41


(Joins sheet 34)
(Joins sheet 40)
(Joins sheet 47)
(Joins sheet 48)
N
Scale 1:20000
5000 Feet
1 Mile
Morris Branch
Oliver Creek
Long
Branch
Creek
Hermon
287
SaB
SaC
SaD
SoC
PvB
BoB
BoC
SbB
SgB
ByE
VeC
YeC
MdE
MoB
SpB
Fr

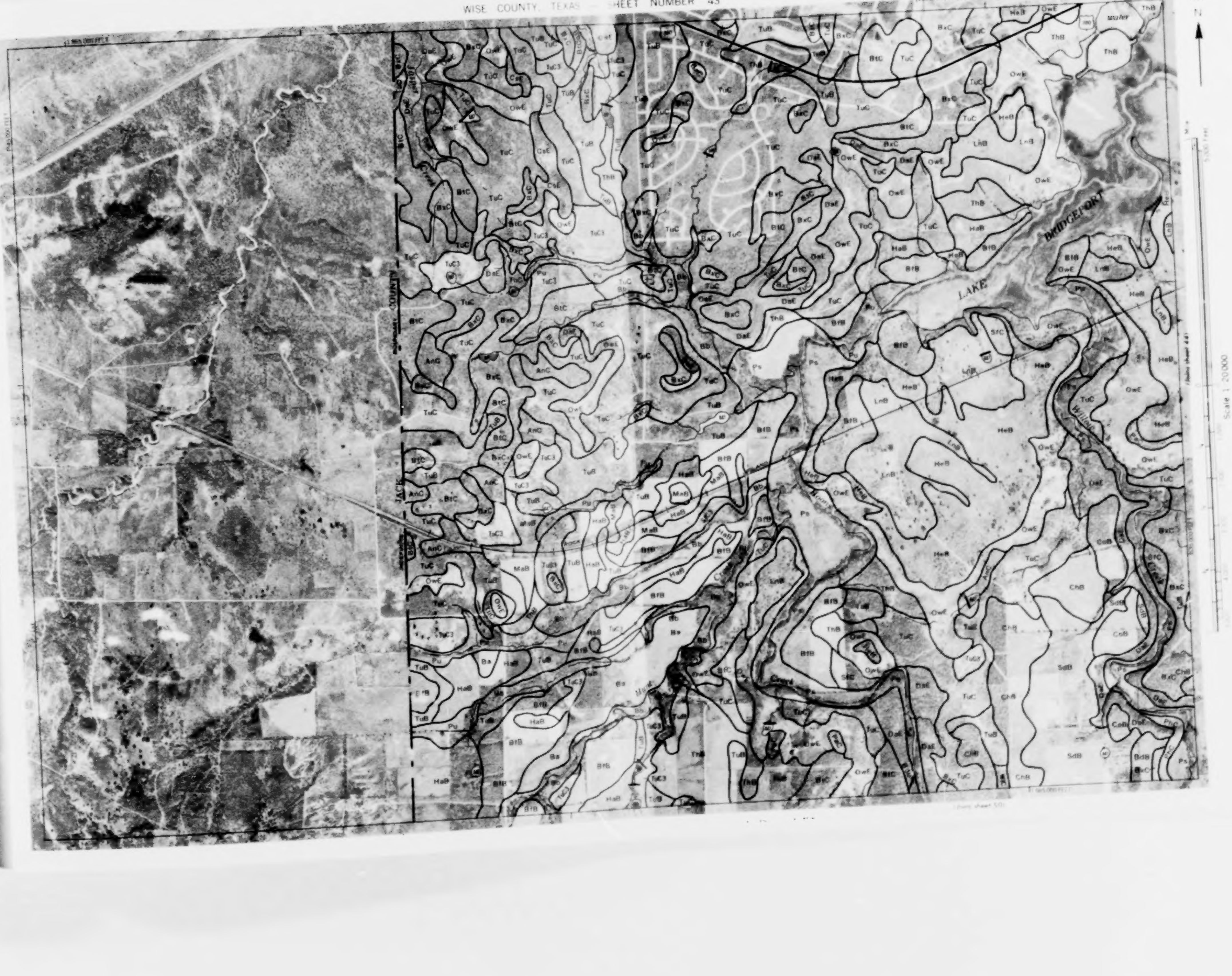
WISE COUNTY, TEXAS — SHEET NUMBER 42



42
N
(Joins sheet 33)
(Joins sheet 41)
(Joins sheet 49)
Scale 1:20000
5000 Feet
Morris
Branch
DENTON COUNTY
BOUNDARY
APPROXIMATE
2 015 000 FEET

WISE COUNTY, TEXAS — SHEET NUMBER 43

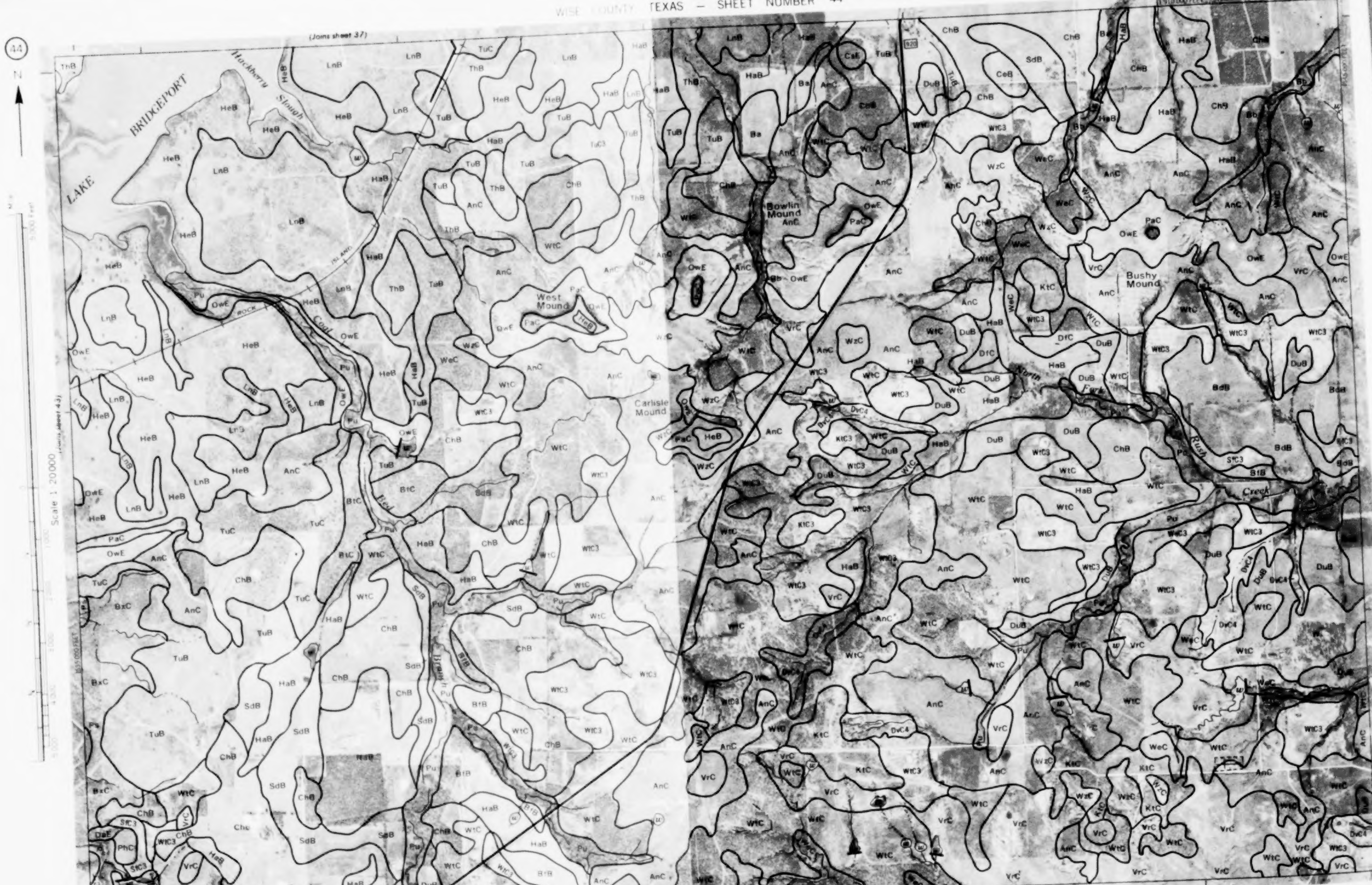
(Joins sheet 36)



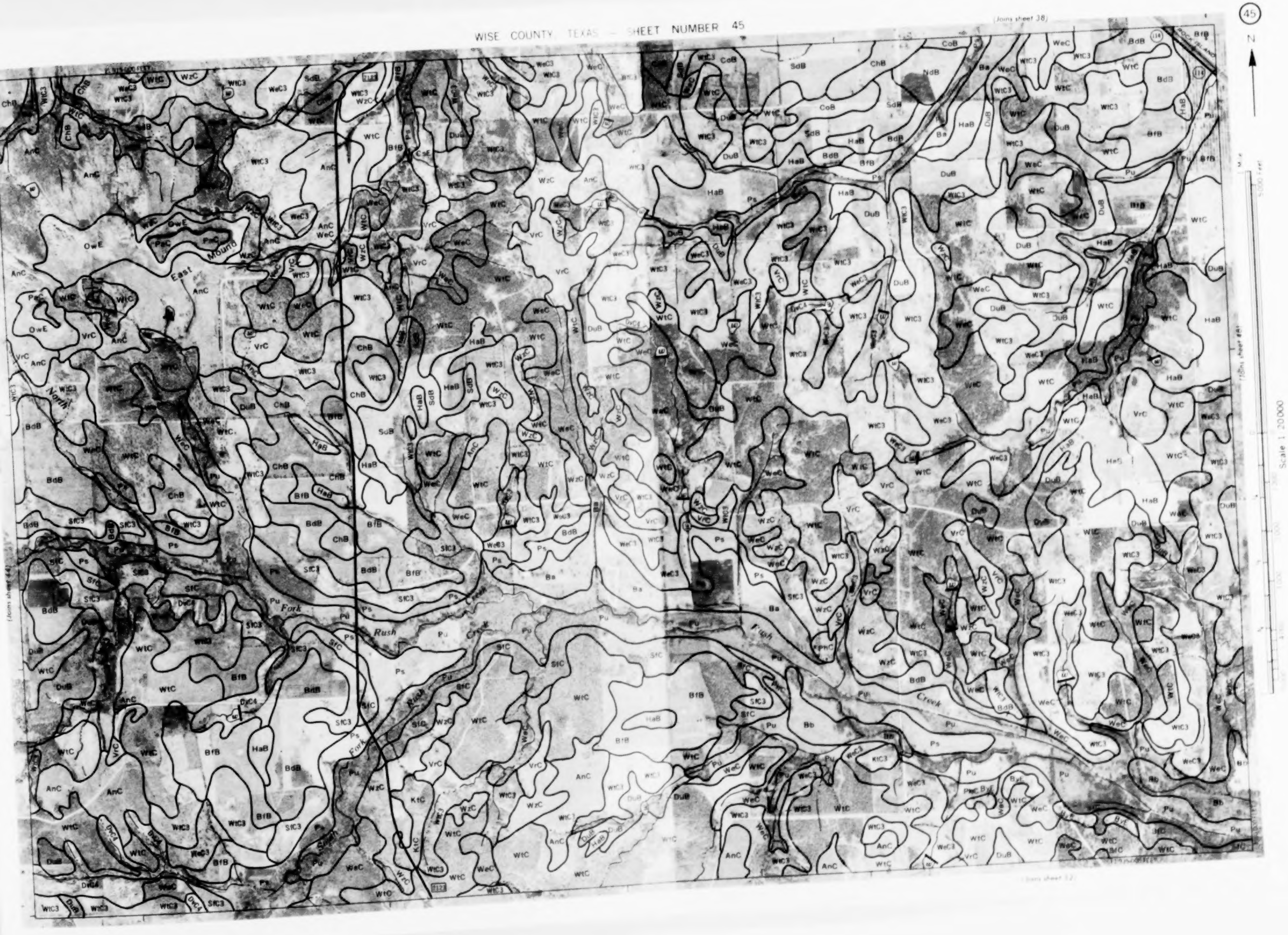
43
N
1 Mile
5000 Feet
Scale 1:20000
(Joins sheet 44)
JACK COUNTY
LAKE BRIDGEPORT
water

(Joins sheet 50)

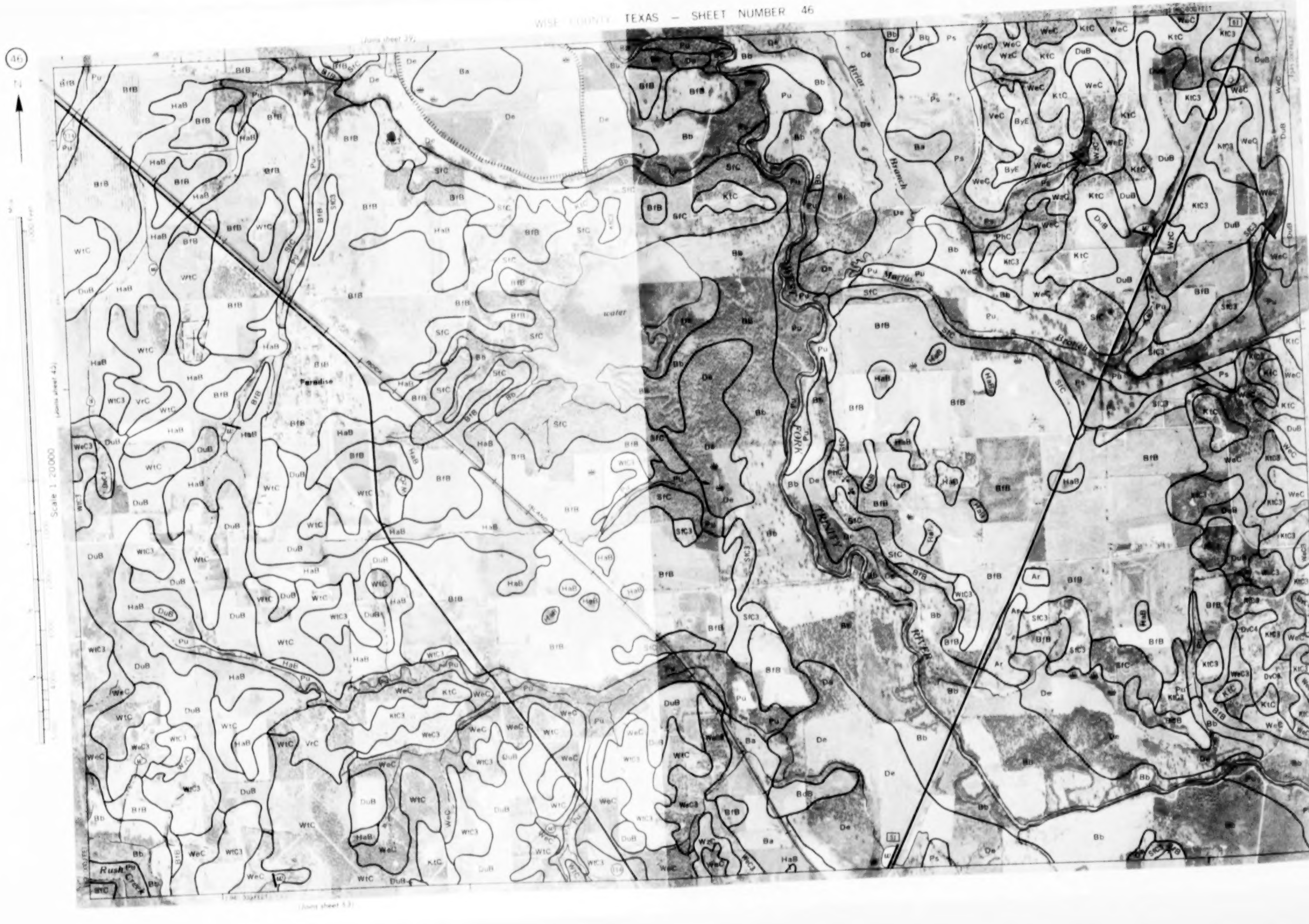
WISE COUNTY, TEXAS — SHEET NUMBER 44


44
N
(Joins sheet 37)
(Joins sheet 43)
(Joins sheet 45)
(Joins sheet 51)
Scale 1:20 000
5000 Feet
LAKE BRIDGEPORT
Hackberry Slough
Coal
Bed
West Mound
Carlisle Mound
Bowlin Mound
Bushy Mound
North Fork
Rush Creek
920
LnB
HeB
HaB
TuB
TuC
ThB
AnC
ChB
WtC
WtC3
OwE
PaC
Pu
SdB
BtC
BtB
BxC
WeC
WzC
DuB
KtC
VrC
DfC
DvC4
BdB
StC3
StC
PhC
DaE
CeB
CsB
Ba
Bb
w

WISE COUNTY, TEXAS — SHEET NUMBER 45

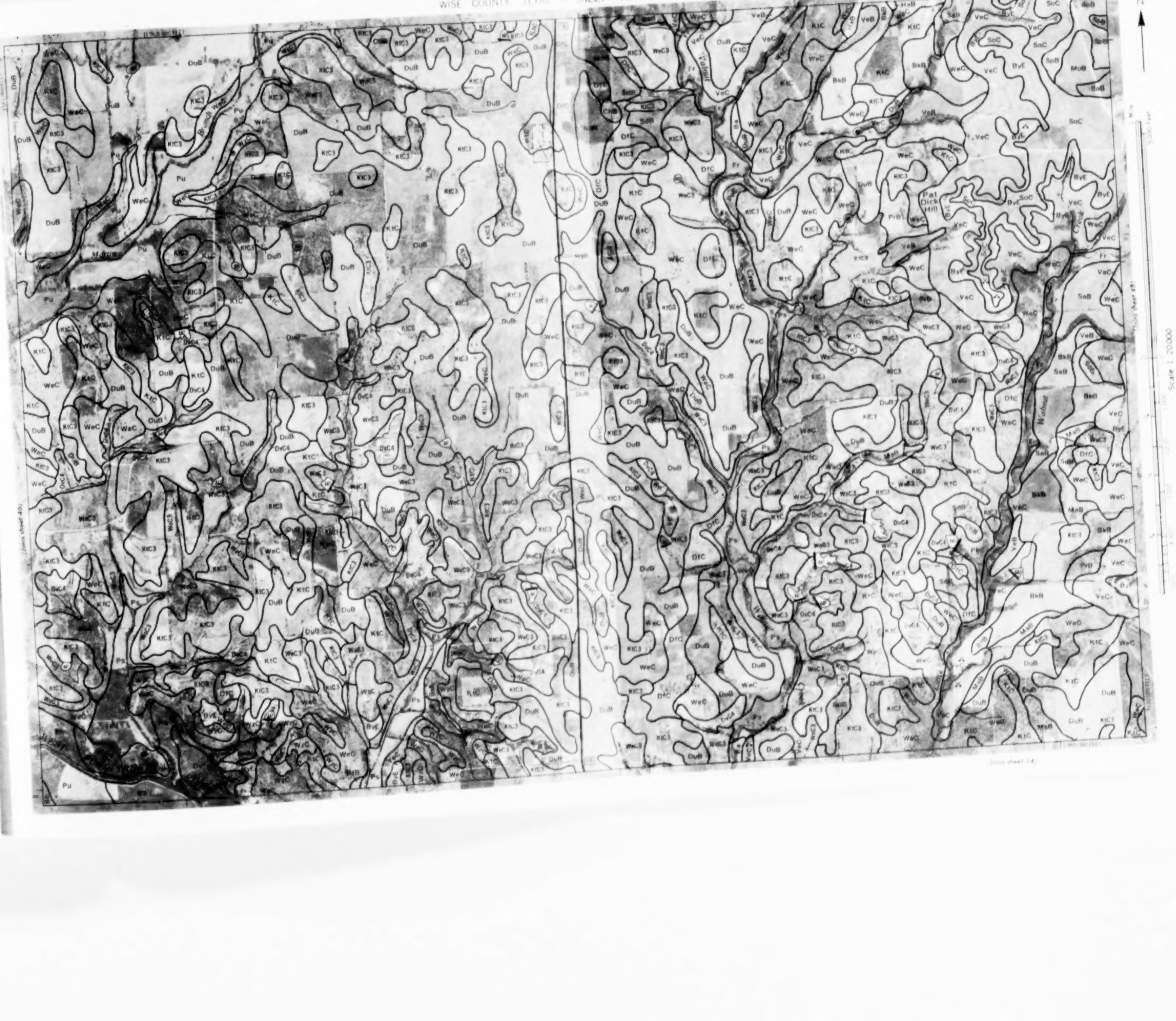

(45)
N
(Joins sheet 38)
(Joins sheet 44)
(Joins sheet 46)
(Joins sheet 52)
1 Mile
5000 Feet
Scale 1:20 000
East Mound
North Fork Rush Creek
Rush Creek
Fork
ROCK ISLAND
WtC
WtC3
WeC
WeC3
WzC
VrC
AnC
OwE
PeC
ChB
BdB
BfB
DuB
HaB
SdB
CoB
NdB
SfC
SfC3
Ps
Pu
Ba
Bb
ByC
KfC
DwC4
CsE
PhC

WISE COUNTY, TEXAS — SHEET NUMBER 46

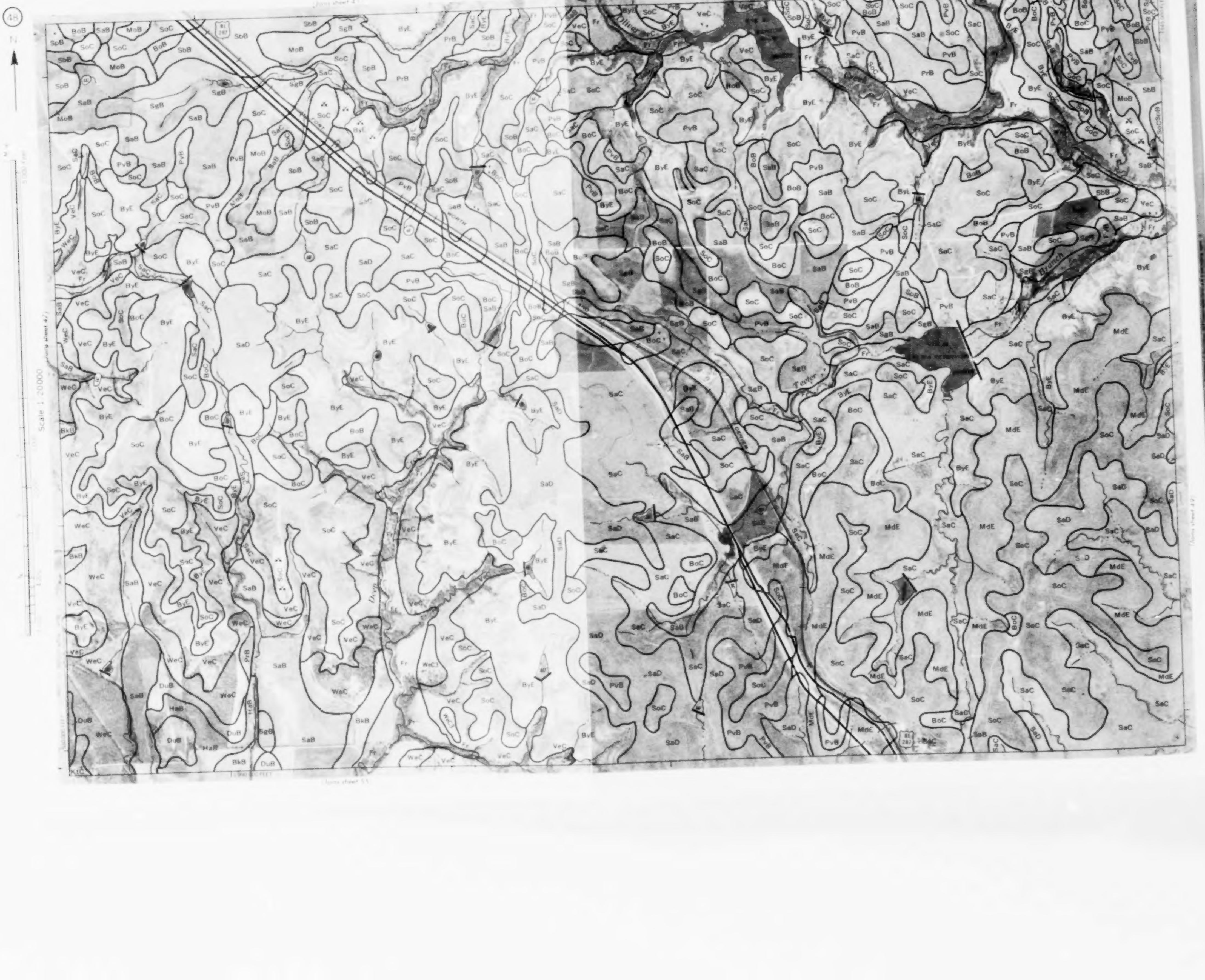

46
N
Scale 1:20 000
(Joins sheet 39)
(Joins sheet 43)
(Joins sheet 47)
(Joins sheet 53)
Paradise
water
Briar Branch
Martin Branch
WEST FORK TRINITY RIVER
Rush Creek
Ar
Ba
Bb
BdB
BfB
ByE
De
DuB
DvC4
HaB
KtC
KtC3
PhC
Ps
Pu
SfC
SfC3
VrC
WeC
WeC3
WtC
WtC3

47

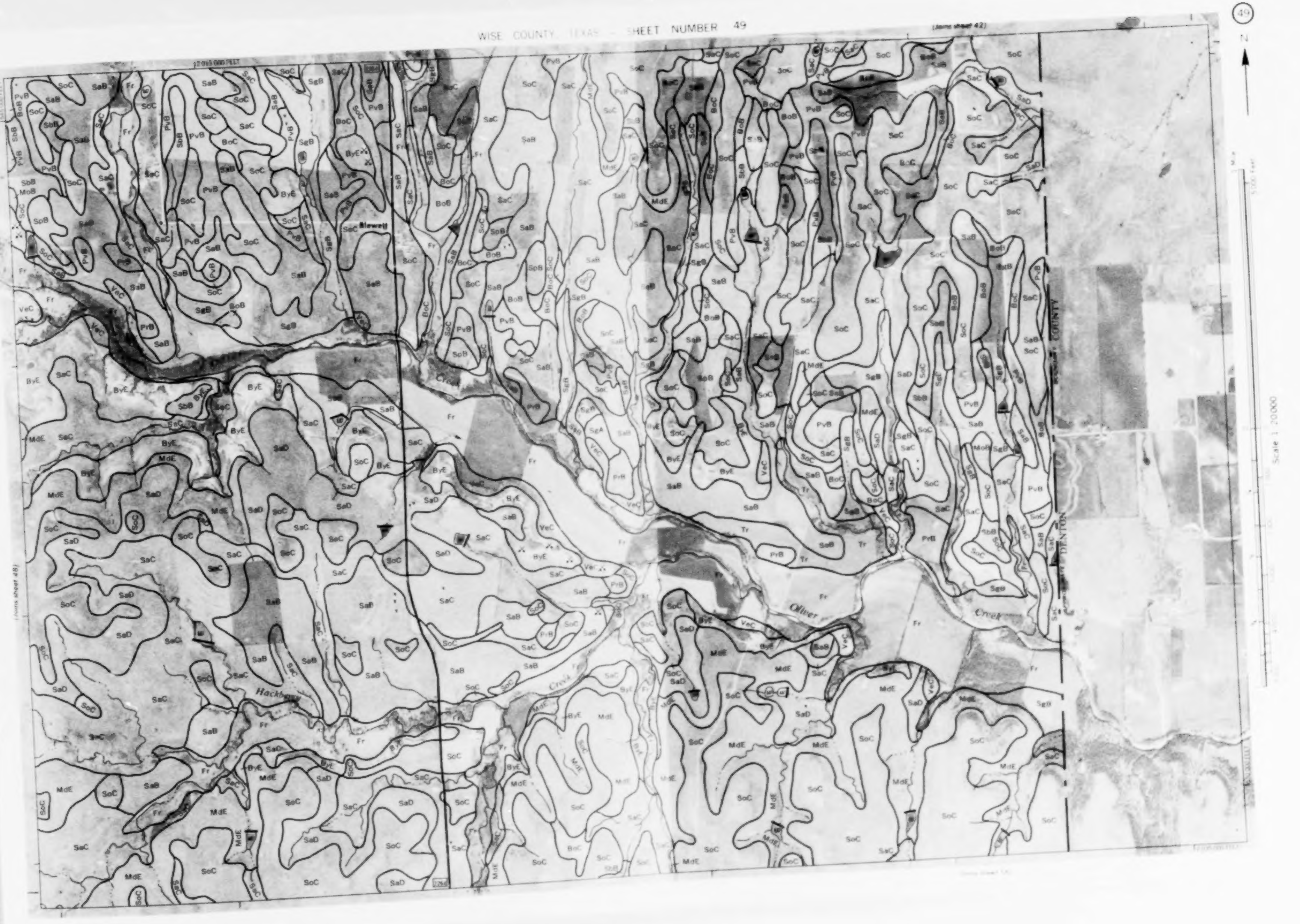
WISE COUNTY, TEXAS — SHEET NUMBER 47


(Joins sheet 40)
N
(Joins sheet 48)
(Joins sheet 54)
(Joins sheet 46)
Scale 1:20000
5000 Feet
1 Mile
Pat Dick Hill
Walnut
Creek
Branch
DuB
WeC
KtC3
KtC
DfC
DvC4
VeC
SoC
ByE
BkB
SaB
MoB
Pu
Ps
Fr

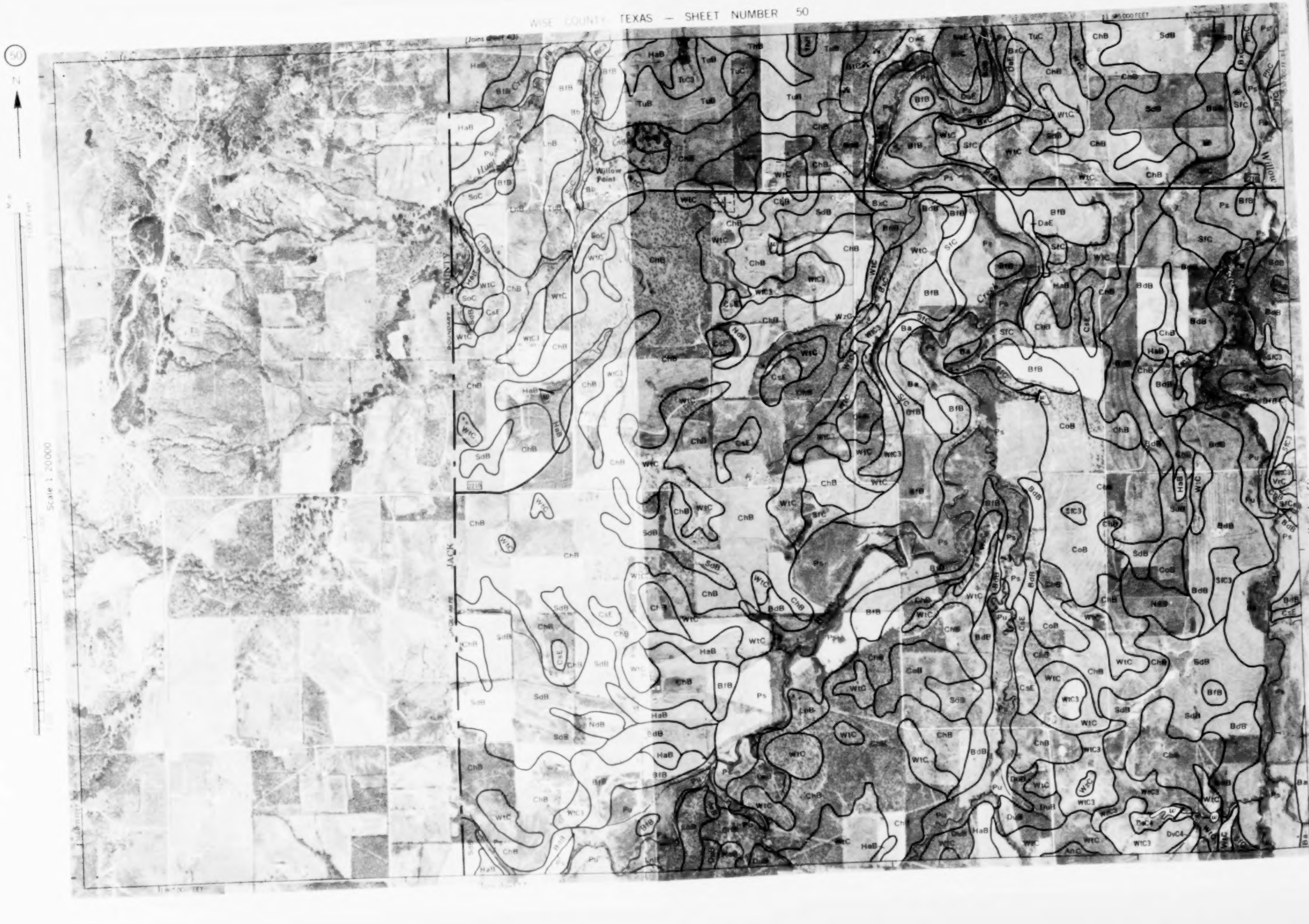
WISE COUNTY, TEXAS — SHEET NUMBER 48


(48)
N
Scale 1:20 000
(Joins sheet 47)
(Joins sheet 53)
(Joins sheet 49)
2 010 000 FEET
Oliver Cr
Teeter
Branch
Deep Cr
287
SoC
SaC
SaB
ByE
BoC
BoB
PvB
VeC
WeC
SaD
MdE
Fr
MoB
SpB
SbB
PrB
SgB
DuB
HaB
BkB
BxB
KtC

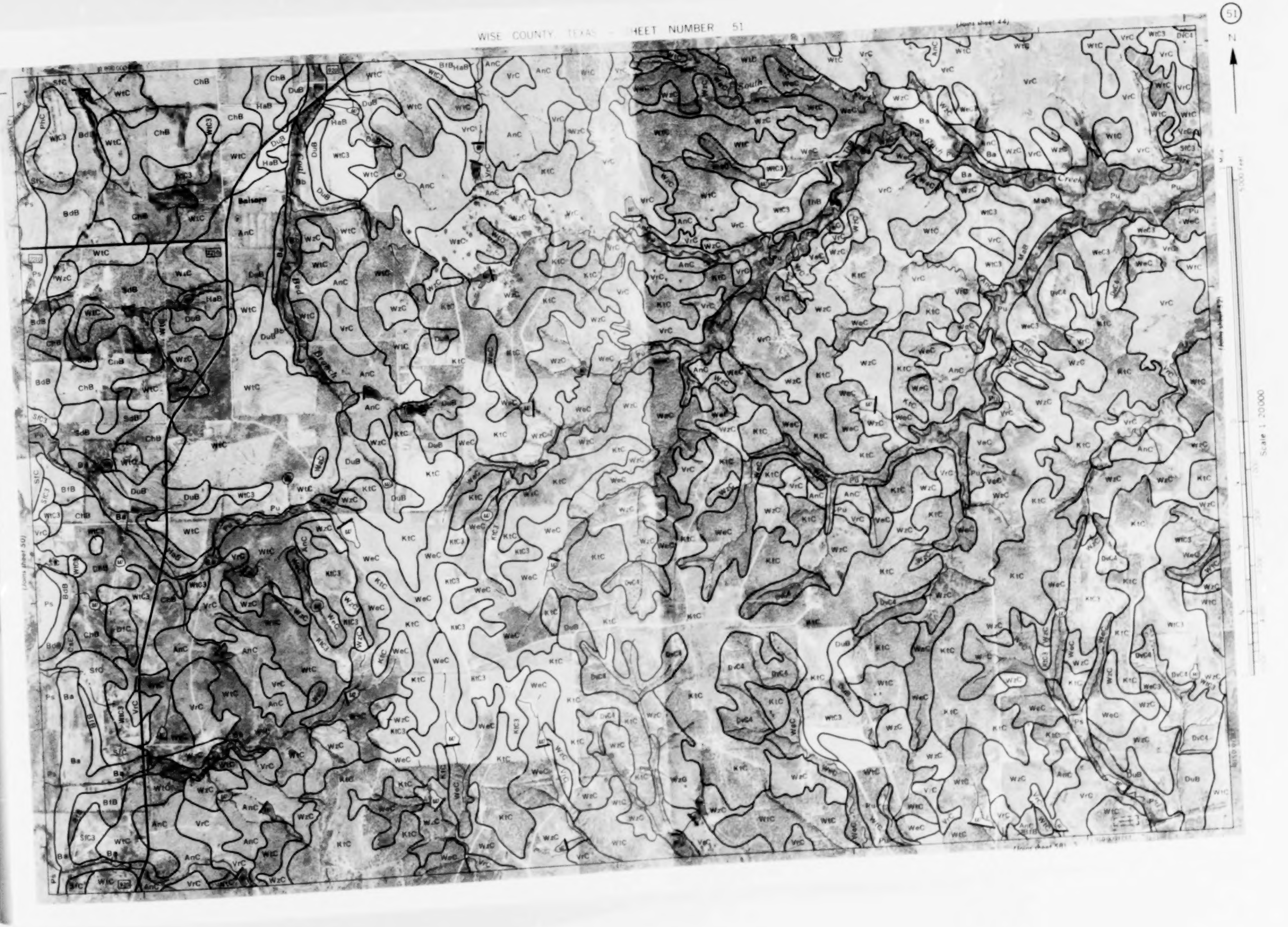
WISE COUNTY, TEXAS — SHEET NUMBER 49


(49)
N
(Joins sheet 42)
(Joins sheet 48)
(Joins sheet [illegible])
2 010 000 FEET
Blewett
Creek
Hackberry
Creek
Oliver
Creek
DENTON COUNTY
WISE COUNTY
1 Mile
5000 Feet
Scale 1:20000

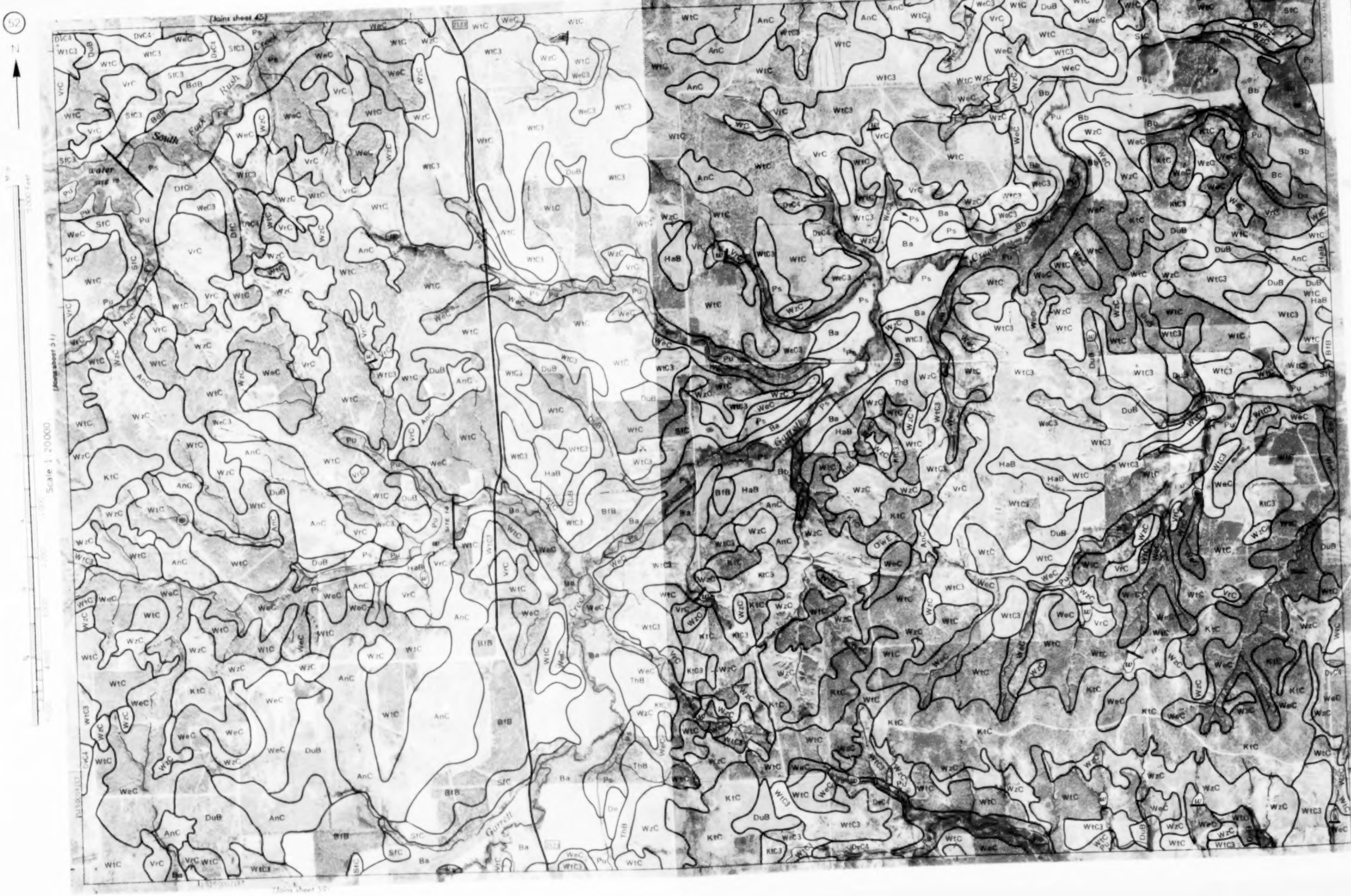
WISE COUNTY, TEXAS — SHEET NUMBER 50


(50)
N
Scale 1:20 000
(Joins sheet 43)
(Joins sheet 51)
5000 FEET
JACK COUNTY BOUNDARY
Willow Point
Hull Creek
Willow
Creek
ChB
SdB
BfB
BdB
WtC
WtC3
HaB
Ps
Pu
SfC
SfC3
CsE
CoB
NdB
TuB
TuC
BxC
DaE
SoC
LnB
Ba
DuB
DvC4
AnC
VrC

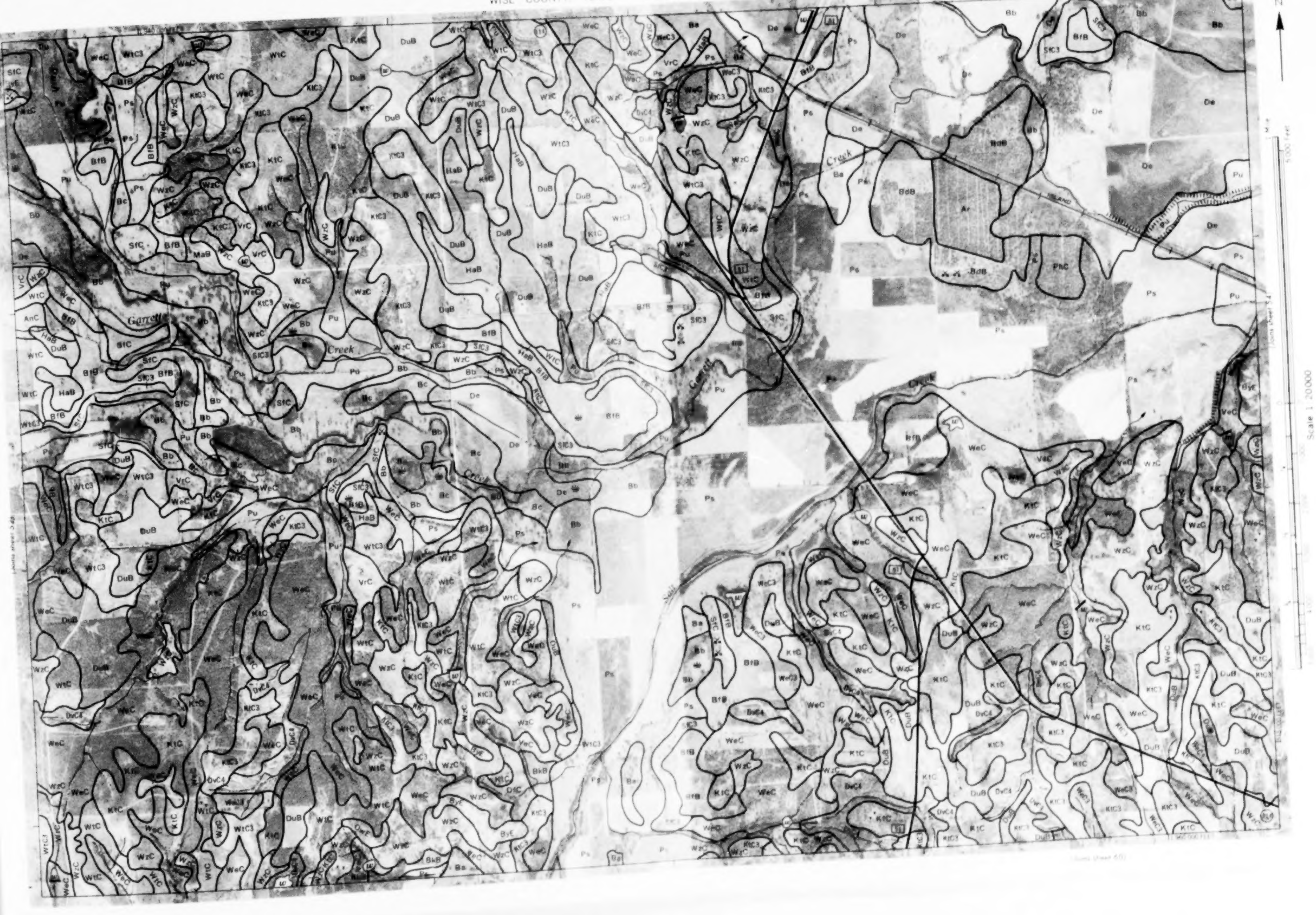
WISE COUNTY, TEXAS — SHEET NUMBER 51


(51)
N
(Joins sheet 44)
(Joins sheet 52)
(Joins sheet 58)
(Joins sheet 50)
Scale 1:20 000
1 Mile
5000 Feet
Balsora
South
Fork
Creek
Branch
Pond
AnC
Ba
BdB
BfB
BfC
Bb
ChB
DuB
DvC4
HaB
KtC
KtC3
MaB
PhC
Ps
Pu
SfC
SfC3
ThB
VrC
WeC
WeC3
WtC
WtC3
WzC

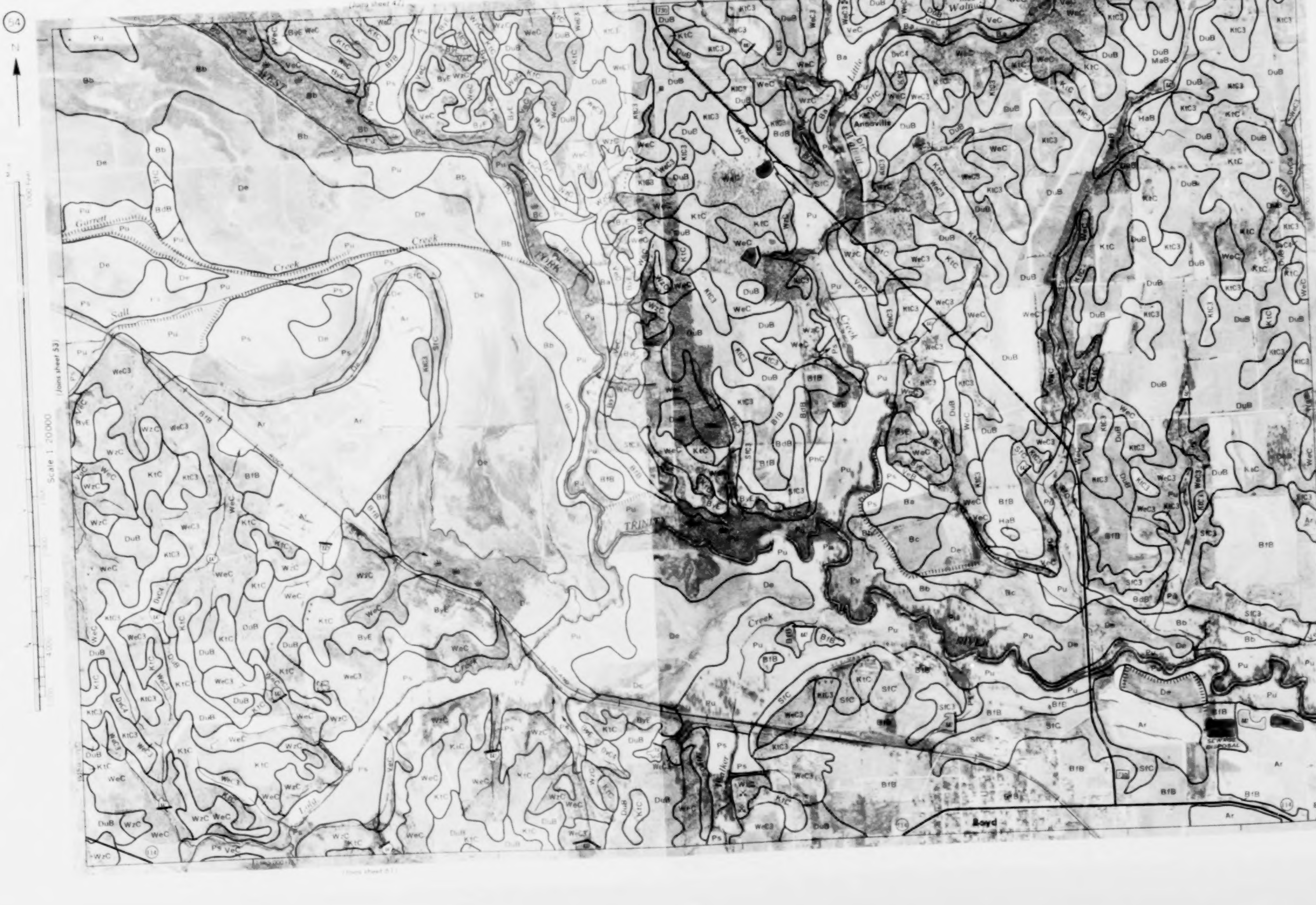
WISE COUNTY TEXAS — SHEET NUMBER 52


52
N
Scale 1:20000
(Joins sheet 45)
(Joins sheet 39)
(Joins sheet 51)
(Joins sheet 53)
South Fork Rush Creek
Gurrell Creek
water
WtC
WtC3
WeC
WzC
AnC
VrC
DuB
KtC
HaB
Ba
Bb
Ps
Pu
SfC
BfB
ThB
DvC4

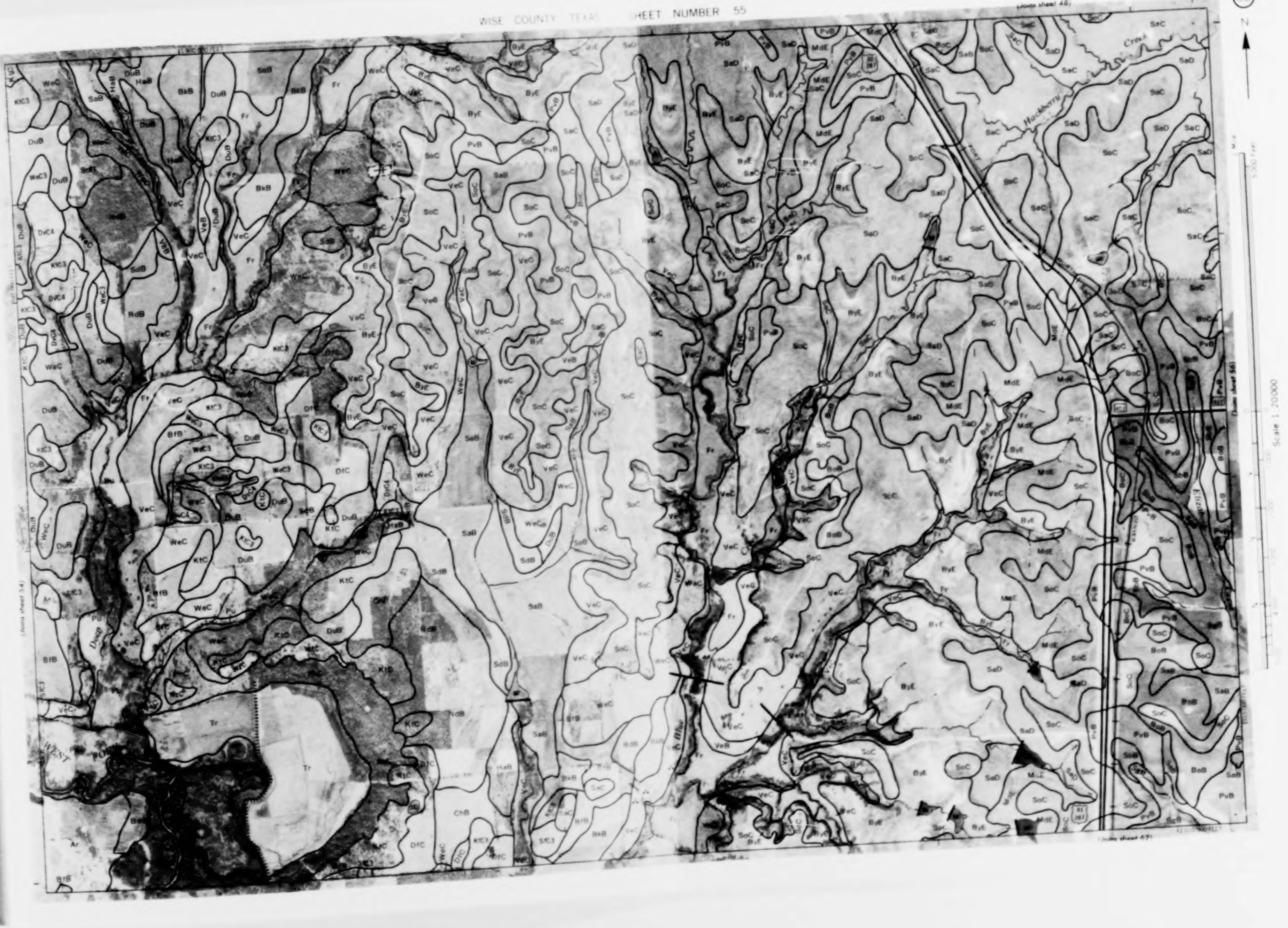
WISE COUNTY, TEXAS — SHEET NUMBER 53


(Joins sheet 46)
(Joins sheet 54)
(Joins sheet 60)
(Joins sheet 52)
N
1 Mile
5000 Feet
Scale 1:20000
Garrett Creek
Creek
Salt Creek
114
51
AnC
Ar
Ba
Bb
Bc
BdB
BfB
BkB
ByE
De
DuB
DvC4
HaB
KtC
KtC3
MaB
Ps
Pu
SfC
SfC3
VrC
WeC
WeC3
WtC
WtC3
WzC

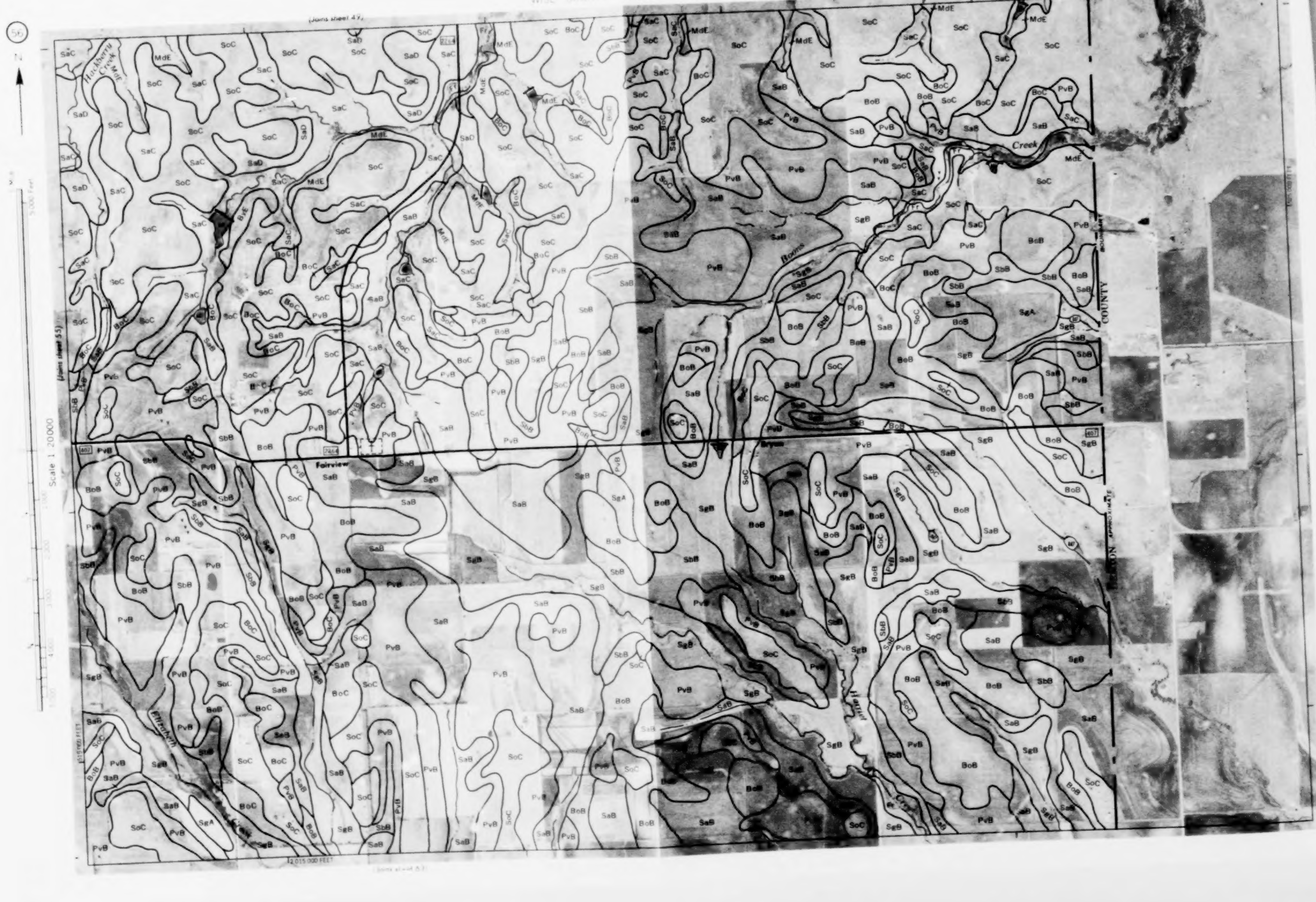
WISE COUNTY, TEXAS — SHEET NUMBER 54


54
N
(Joins sheet 42)
(Joins sheet 53)
(Joins sheet 51)
(Joins sheet 55)
Scale 1:20 000
1 985 000 FEET
West Fork
Garrett Creek
Salt Creek
Trinity River
Little West Fork
Walnut Creek
Ansonville
Lola Creek
Boyd
Sewage Disposal
730
114
Pu
Bb
De
Ps
Ar
BfB
WeC
WeC3
WzC
KtC
KtC3
DuB
ByE
VeC
StC
StC3
DrC
Ba
Bc
HaB
MaB
BdB
PhC
DvC4

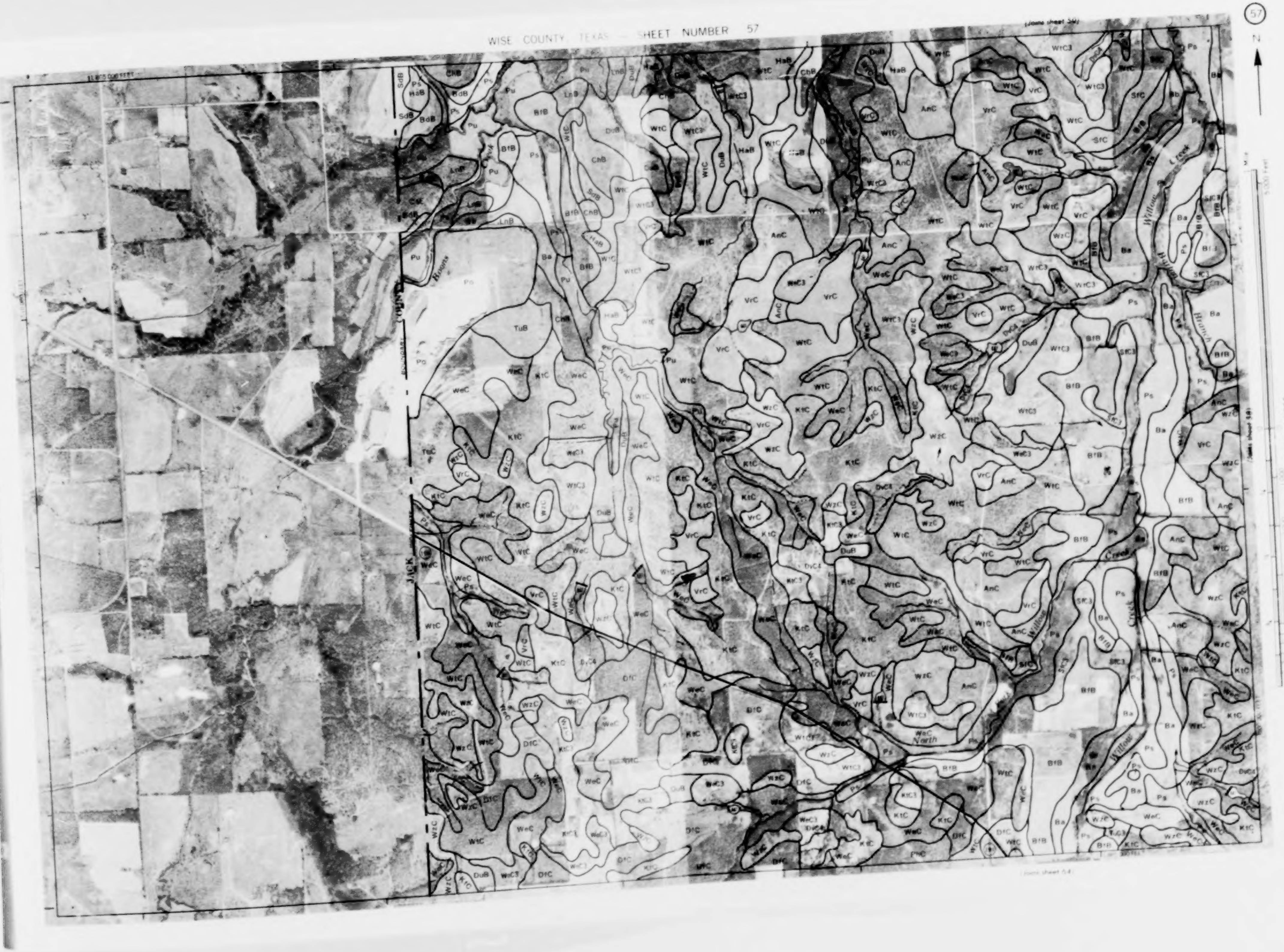
WISE COUNTY TEXAS SHEET NUMBER 55


(Joins sheet 48)
(Joins sheet 54)
(Joins sheet 56)
(Joins sheet 57)
N
Scale 1:20000
5000 Feet
Hackberry Creek
West Fork
287
SaC
SaD
SoC
ByE
MdE
PvB
VeC
WeC
Fr
DuB
KtC
KtC3
BfB
SaB
SdB
BoB
BoC
Tr
Ar

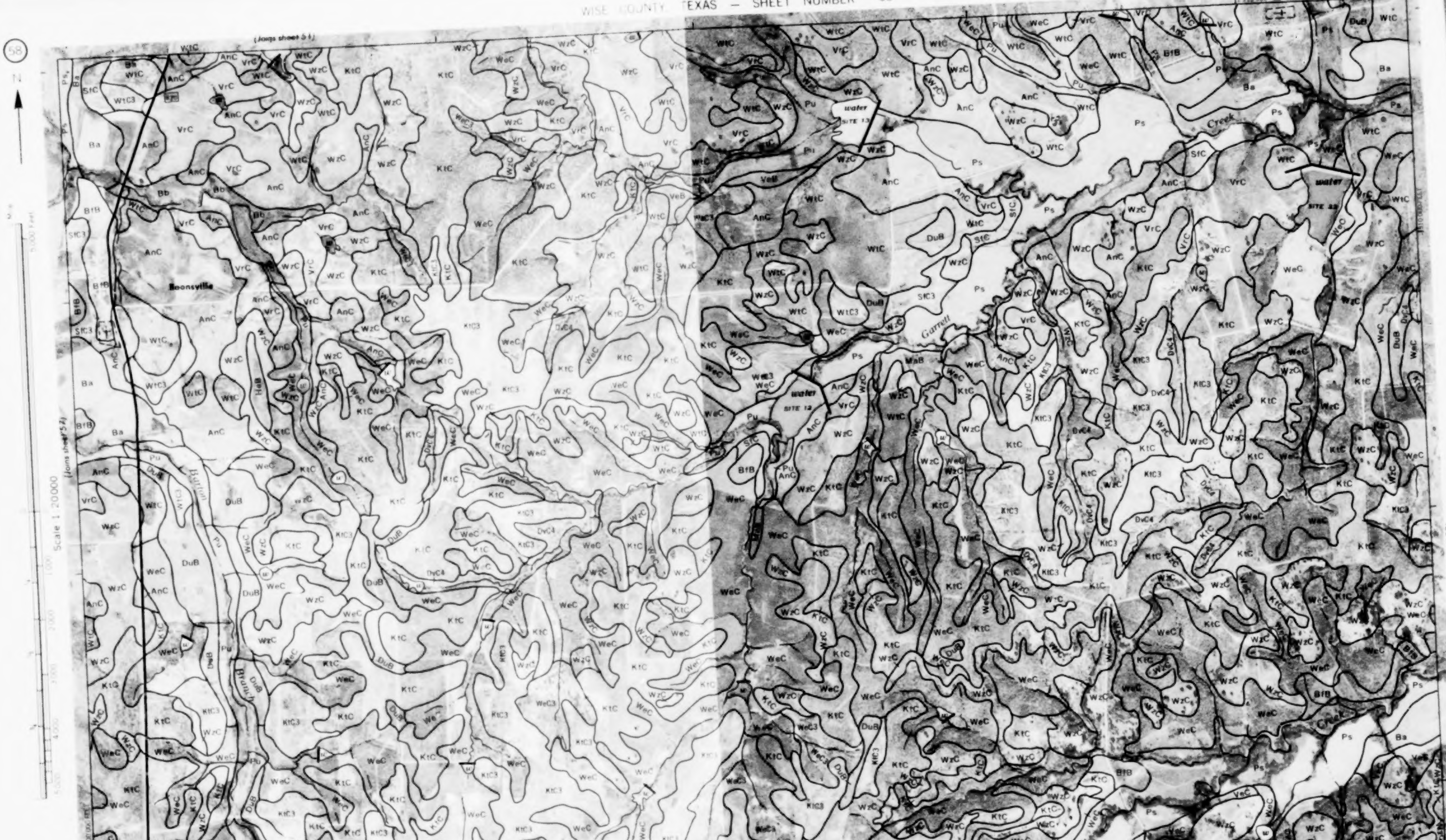
WISE COUNTY, TEXAS — SHEET NUMBER 56


56
N
Scale 1:20000
(Joins sheet 49)
(Joins sheet 55)
(Joins sheet 63)
2 015 000 FEET
Hackberry Creek
Creek
Fairview
Elizabeth Creek
SoC
SaC
SaD
MdE
BoC
PvB
SaB
SbB
SgB
BoB
SgA
COUNTY BOUNDARY
APPROXIMATE

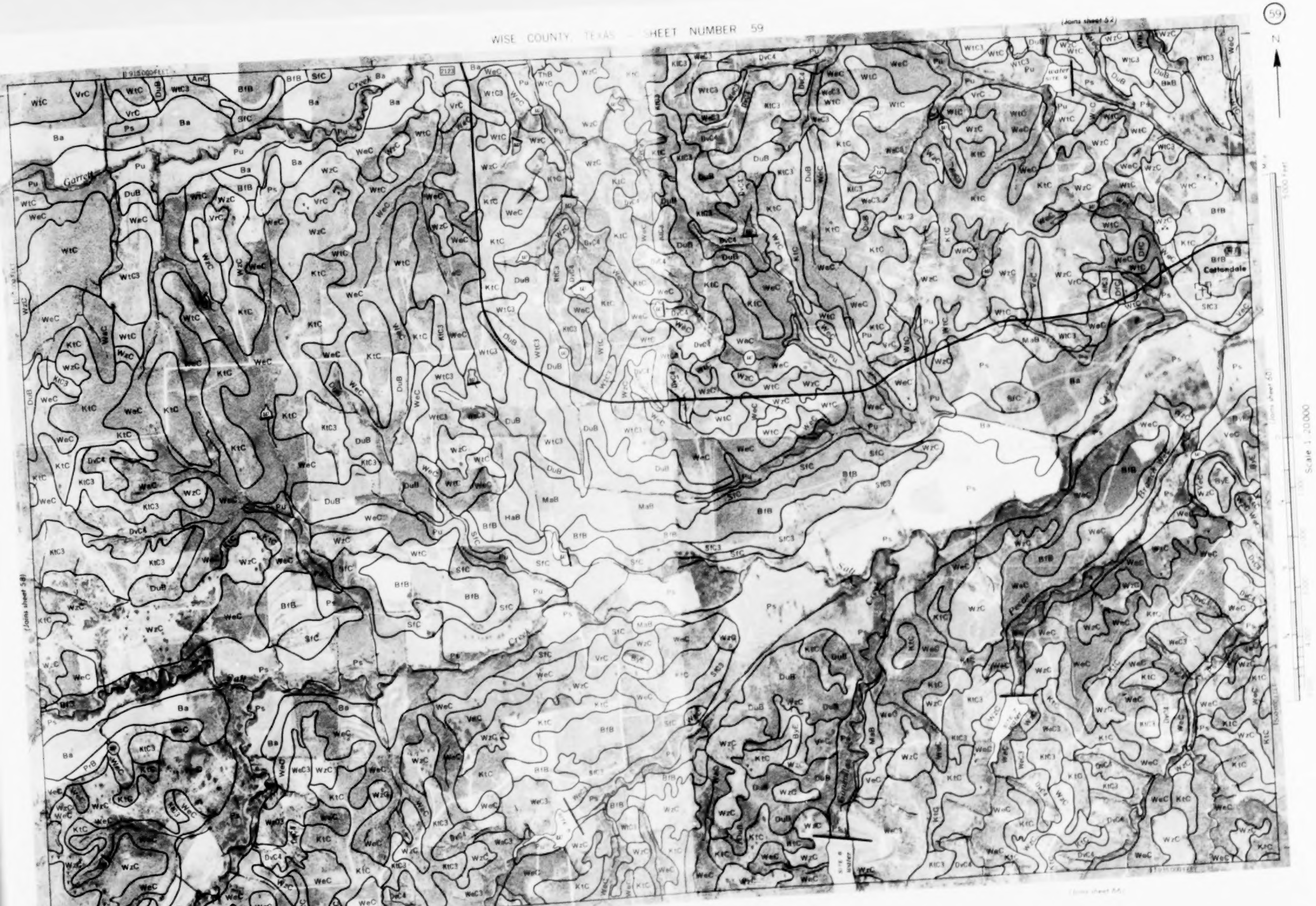
WISE COUNTY, TEXAS — SHEET NUMBER 57


(Joins sheet 50)
(Joins sheet 54)
(Joins sheet 58)
N
Scale 1:20 000
1 Mile
5000 Feet
JACK COUNTY
Brown
Willow Creek
North
Willow
Creek
Branch
AnC
Ba
BfB
BdB
ChB
DfC
DuB
HaB
KtC
LnB
Ps
Pu
SdB
SfC
SfC3
TuB
VrC
WeC
WeC3
WtC
WtC3
WzC

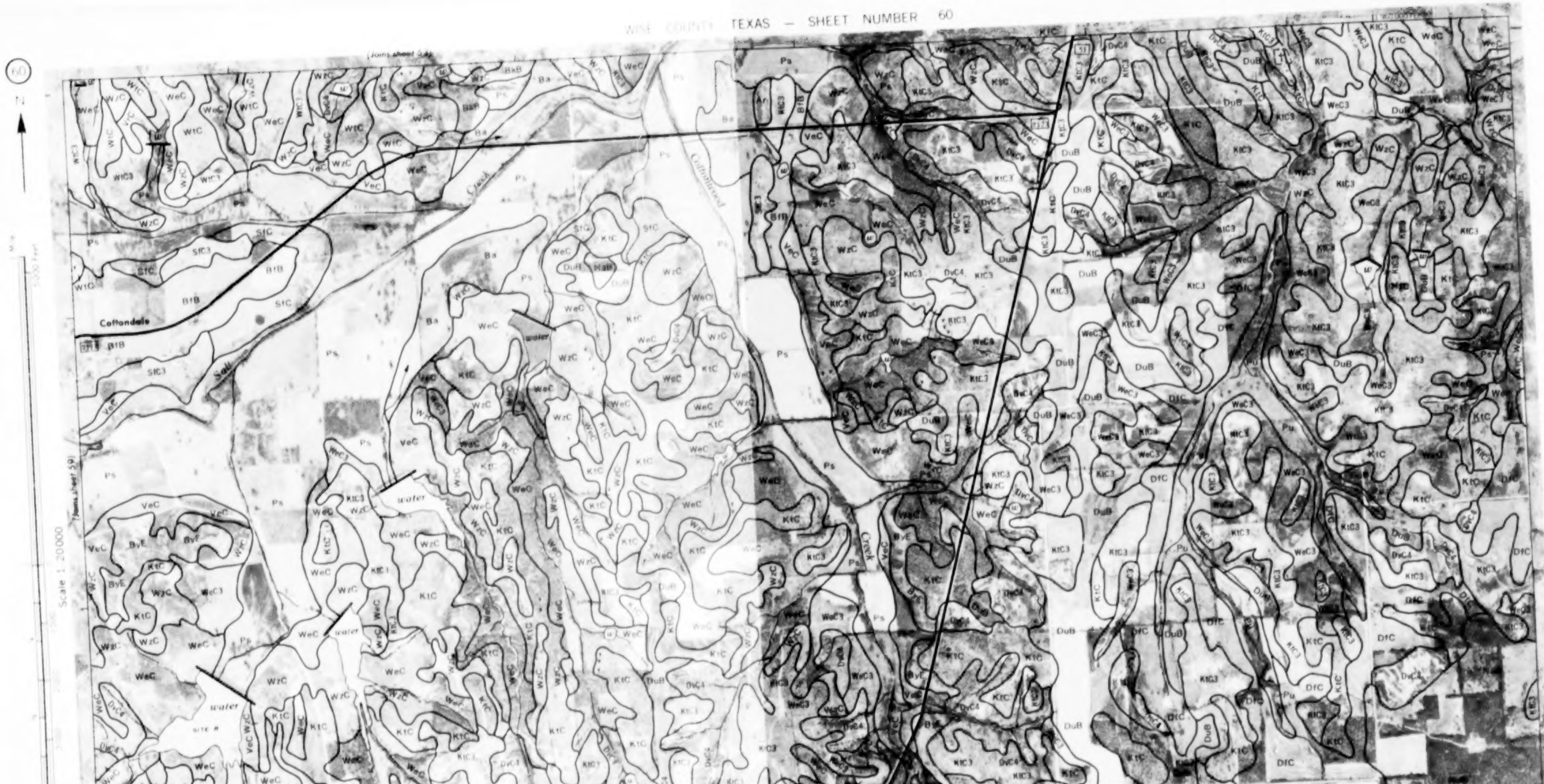
WISE COUNTY, TEXAS — SHEET NUMBER 58

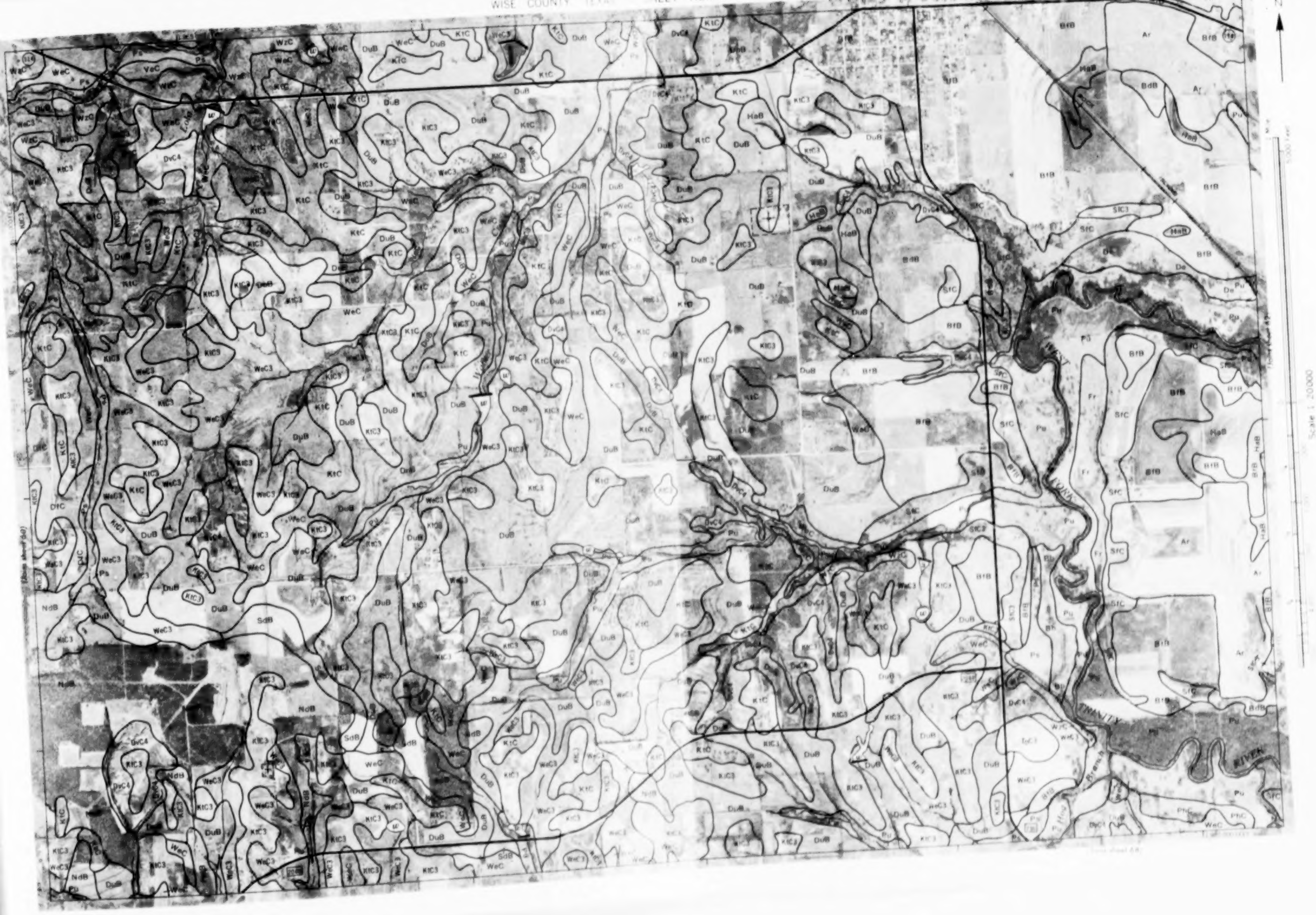

58
N
(Joins sheet 51)
(Joins sheet 57)
(Joins sheet 59)
(Joins sheet 65)
Scale 1:20 000
5,000 Feet
1,900,000 FEET
11,910,000 FEET
Boonsville
Burton Branch
Garrett Creek
water
SITE 13
SITE 12
SITE 22
AnC
Ba
Bb
BfB
DuB
DvC4
HaB
KtC
KtC3
Ps
Pu
SfC
SfC3
VrC
WeC
WeC3
WtC
WtC3
WzC

WISE COUNTY, TEXAS — SHEET NUMBER 59

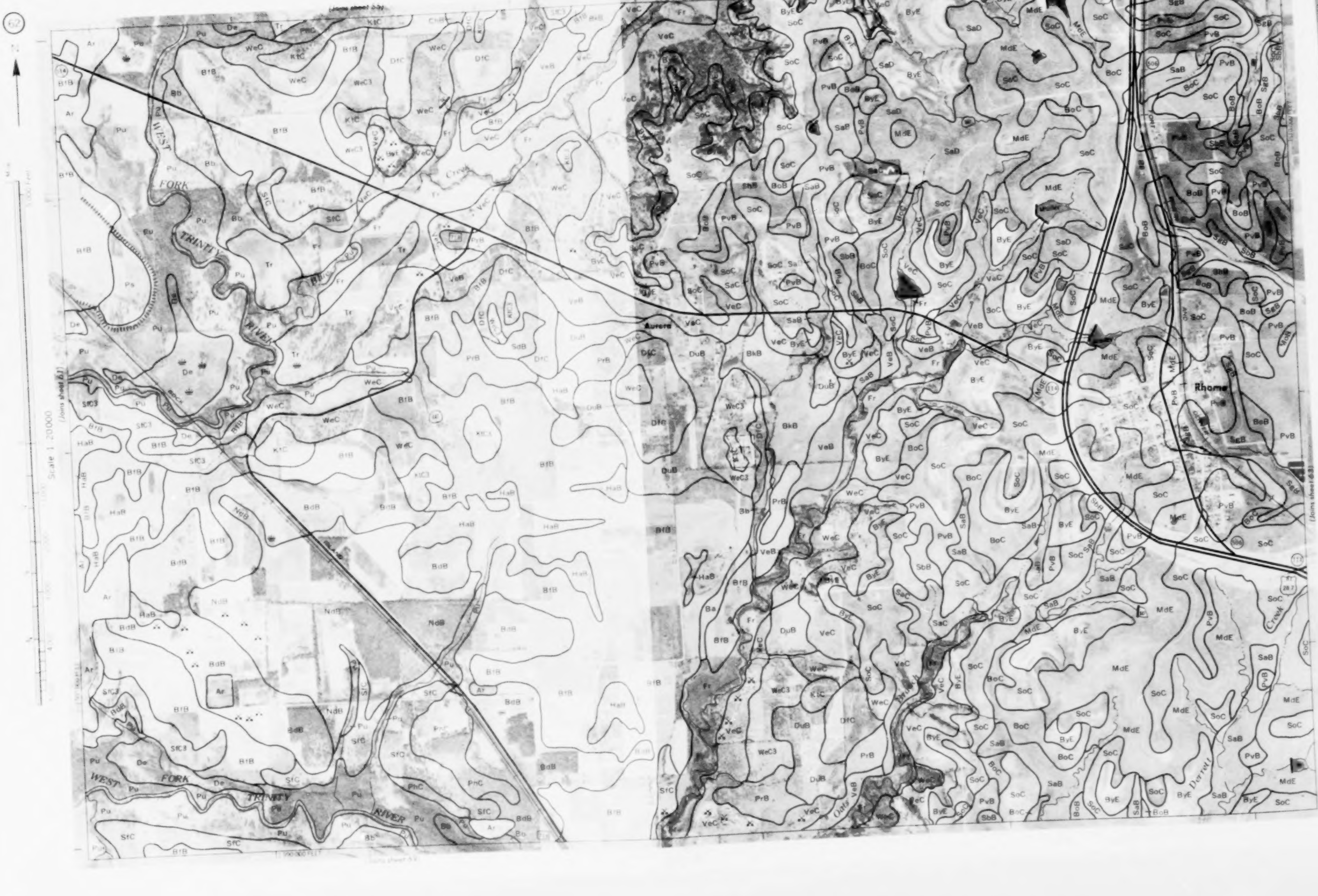

59
N
(Joins sheet 52)
(Joins sheet 58)
(Joins sheet 60)
(Joins sheet 66)
1 915 000 FEET
Garrett Creek
Salt Creek
Cottondale
water SITE 9
Scale 1:20 000
5000 Feet
1 Mile

WISE COUNTY, TEXAS — SHEET NUMBER 60

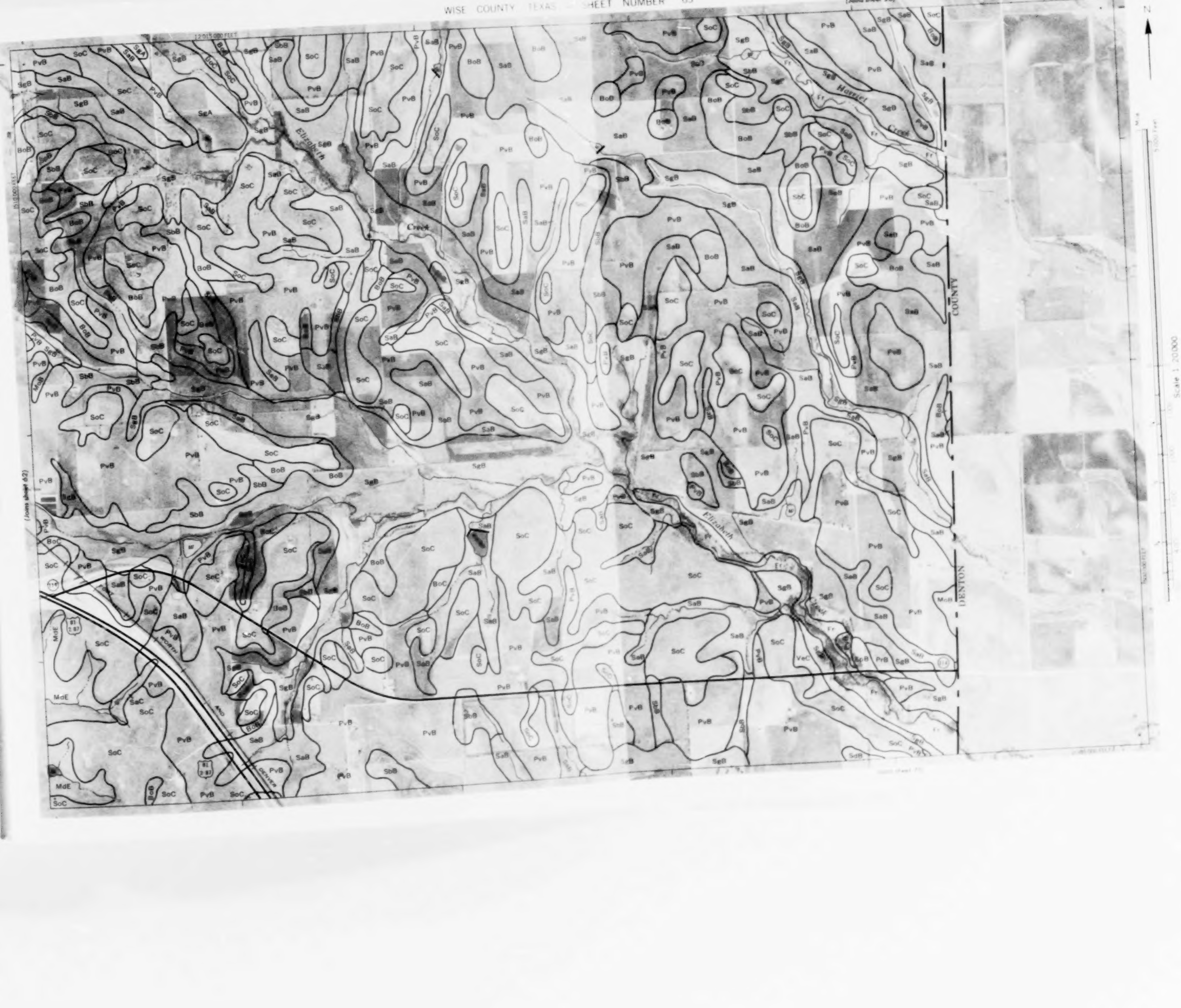

60
N
(Joins sheet 54)
(Joins sheet 59)
(Joins sheet 61)
(Joins sheet 67)
Scale 1:20000
5000 Feet
Cottondale
Cottonwood
Creek
Salt
water
SITE 8
SITE 10
Ps
WeC
WzC
KtC
KtC3
DuB
DvC4
DfC
NdB
WeC3
BtB
StC
StC3
VeC
ByE
Ba
Pu


(Joins sheet 54)
(Joins sheet 60)
(Joins sheet 68)
N
Scale 1:20000
1 Mile
5000 Feet
WEST FORK
TRINITY RIVER
Branch
Ar
BfB
BdB
HaB
SfC
SfC3
De
Pu
Fr
Pg
PhC
DuB
KtC
KtC3
WeC
WeC3
WzC
DvC4
DfC
NdB
SdB
Ps

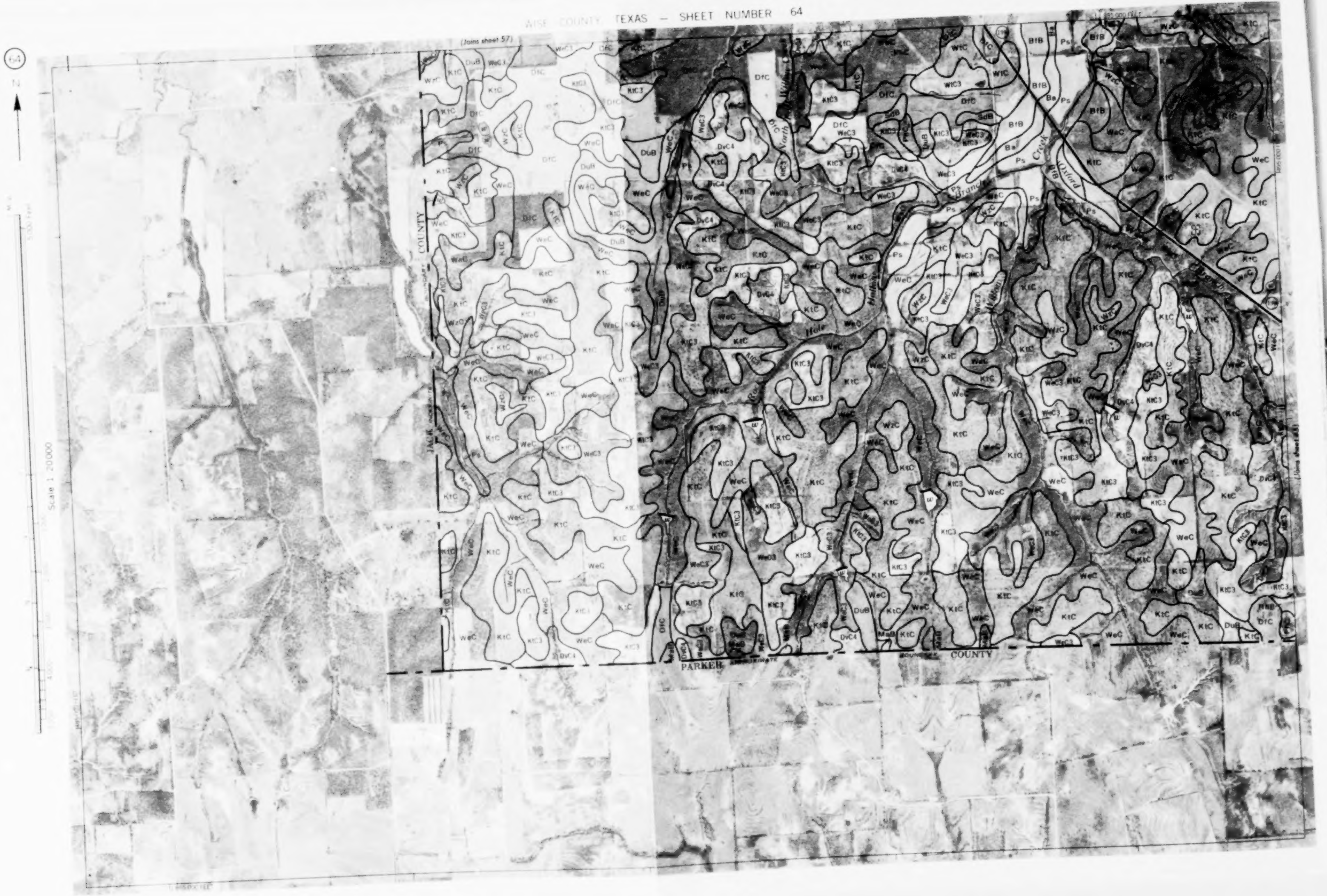
WISE COUNTY, TEXAS — SHEET NUMBER 62


62
N
Scale 1:20000
5000 Feet
(Joins sheet 53)
(Joins sheet 61)
(Joins sheet 63)
(Joins sheet 67)
2 010 000 FEET
WEST FORK TRINITY RIVER
Creek
Aurora
Rhome
Oates Branch
Derrett Creek
114
287
81

WISE COUNTY, TEXAS — SHEET NUMBER 63

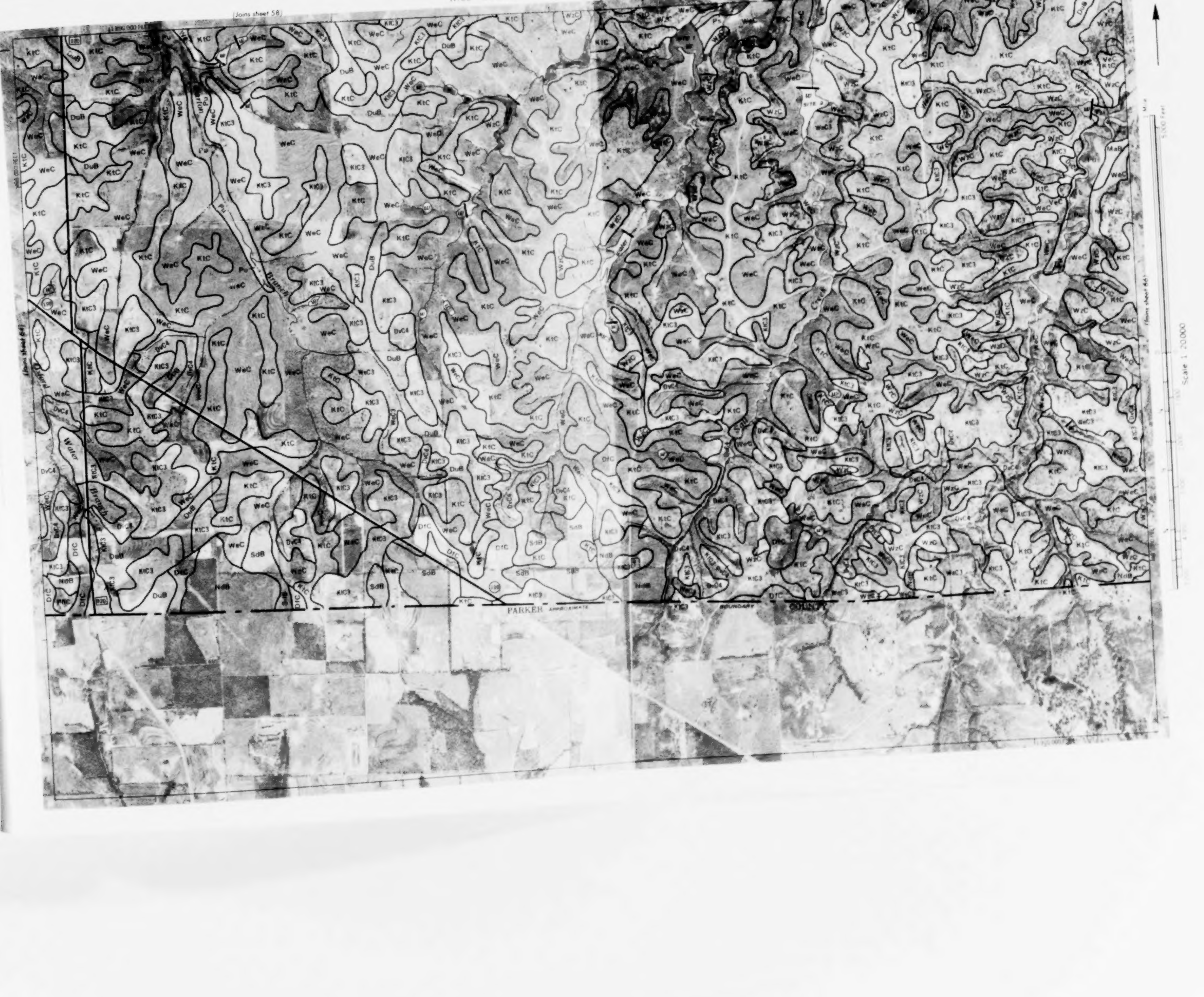

(Joins sheet 56)
(Joins sheet 62)
N
Elizabeth Creek
Hornet Creek
DENTON COUNTY
Scale 1:20 000
PvB
SoC
SaB
SgB
SbB
BoB
SeA
Fr
MdE
VeC
PrB
BoC

WISE COUNTY, TEXAS — SHEET NUMBER 64

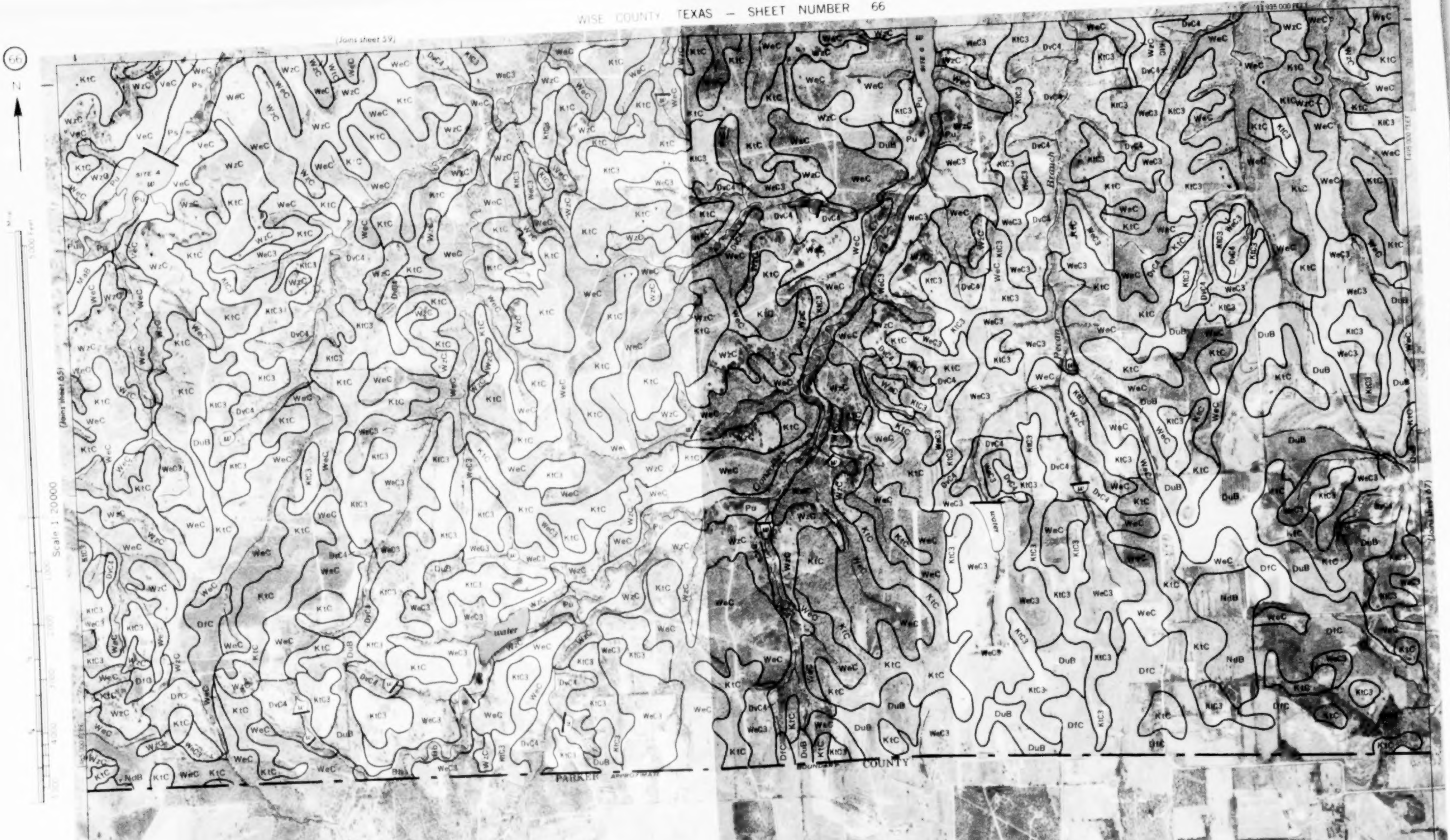


(Joins sheet 57)
64
N
Scale 1:20 000
JACK COUNTY
PARKER COUNTY
North
Big Creek
Oxford Branch
Hollow
Hole
KtC
KtC3
WeC
WeC3
DfC
DuB
DvC4
BfB
Ba
Ps
SdB
MaB

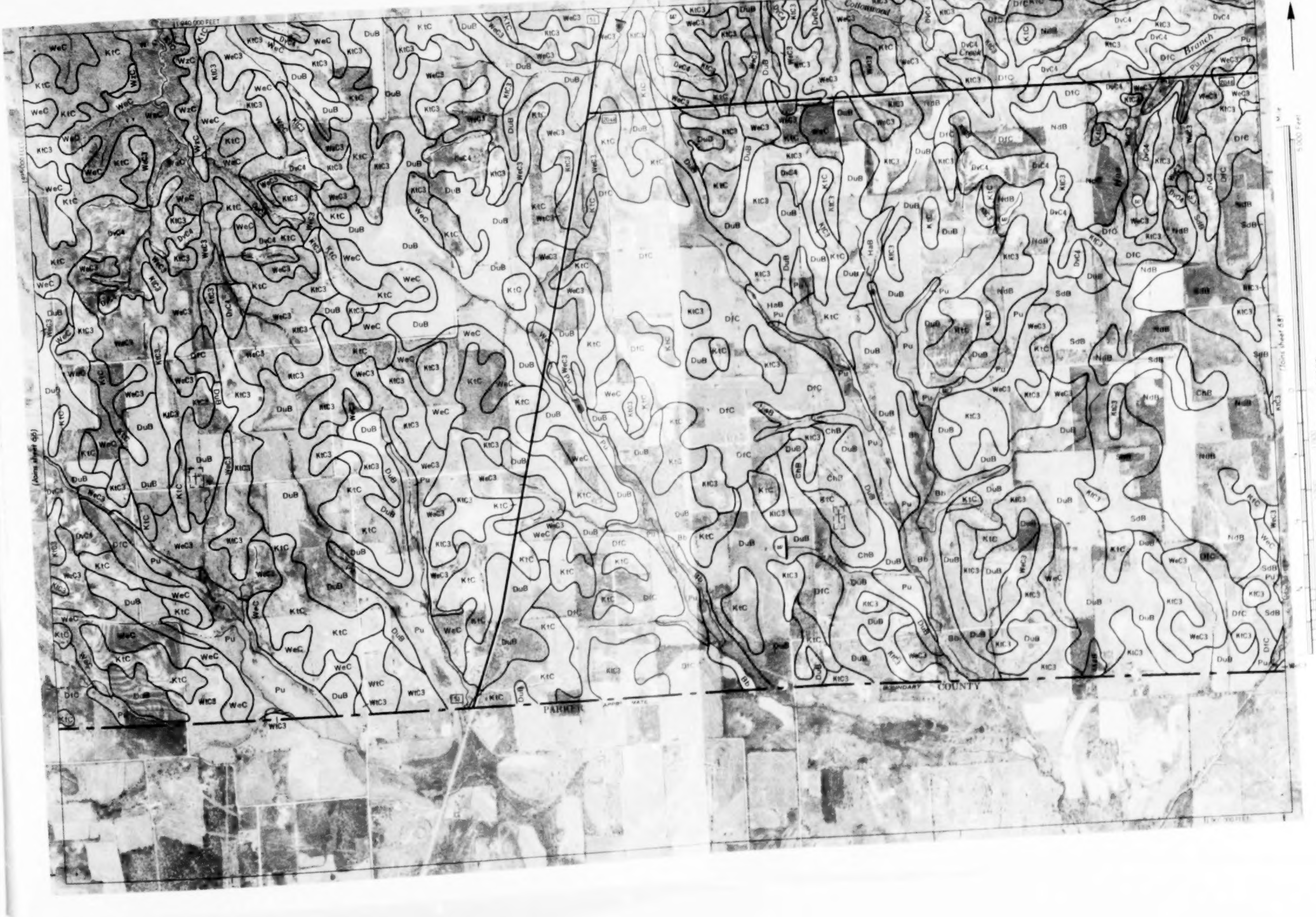
WISE COUNTY, TEXAS — SHEET NUMBER 65


(Joins sheet 58)
(Joins sheet 64)
(Joins sheet 66)
N
Scale 1:20 000
1 Mile
5000 Feet
PARKER
APPROXIMATE
BOUNDARY
COUNTY
KtC
KtC3
WeC
WzC
DuB
DvC4
DfC
SdB
NdB
MaB
Pu
Branch
Creek
Water
SITE 4

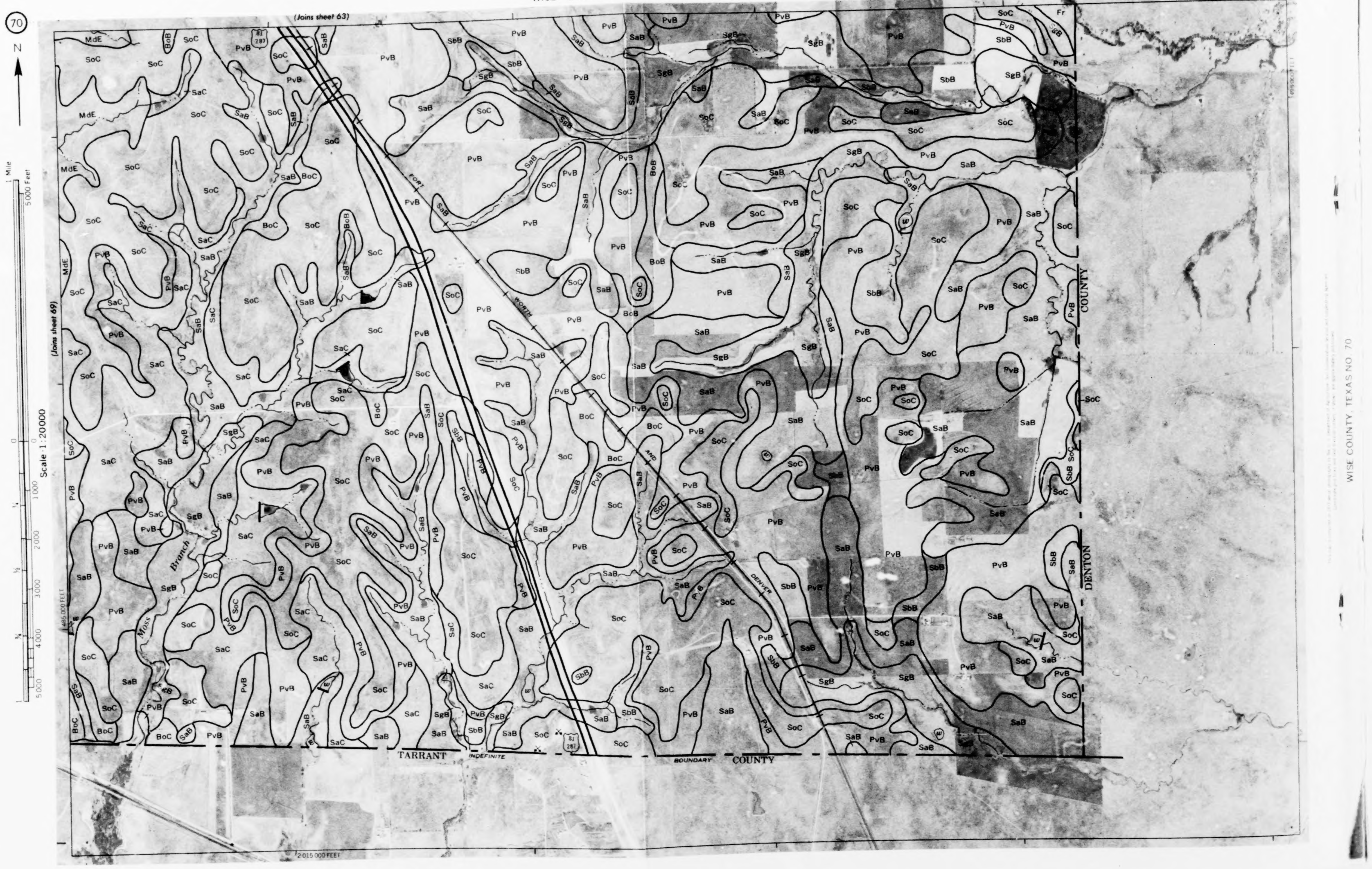
WISE COUNTY, TEXAS — SHEET NUMBER 66


66
N
(Joins sheet 59)
(Joins sheet 65)
(Joins sheet 67)
1 935 000 FEET
Scale 1:20000
5000 Feet
1 Mile
SITE 4
SITE 6
water
Pecan Branch
PARKER
COUNTY
BOUNDARY
KtC
KtC3
WeC
WeC3
WzC
DvC4
DuB
DfC
NdB
VeC
Ps
Pu
MaB

WISE COUNTY, TEXAS — SHEET NUMBER 67

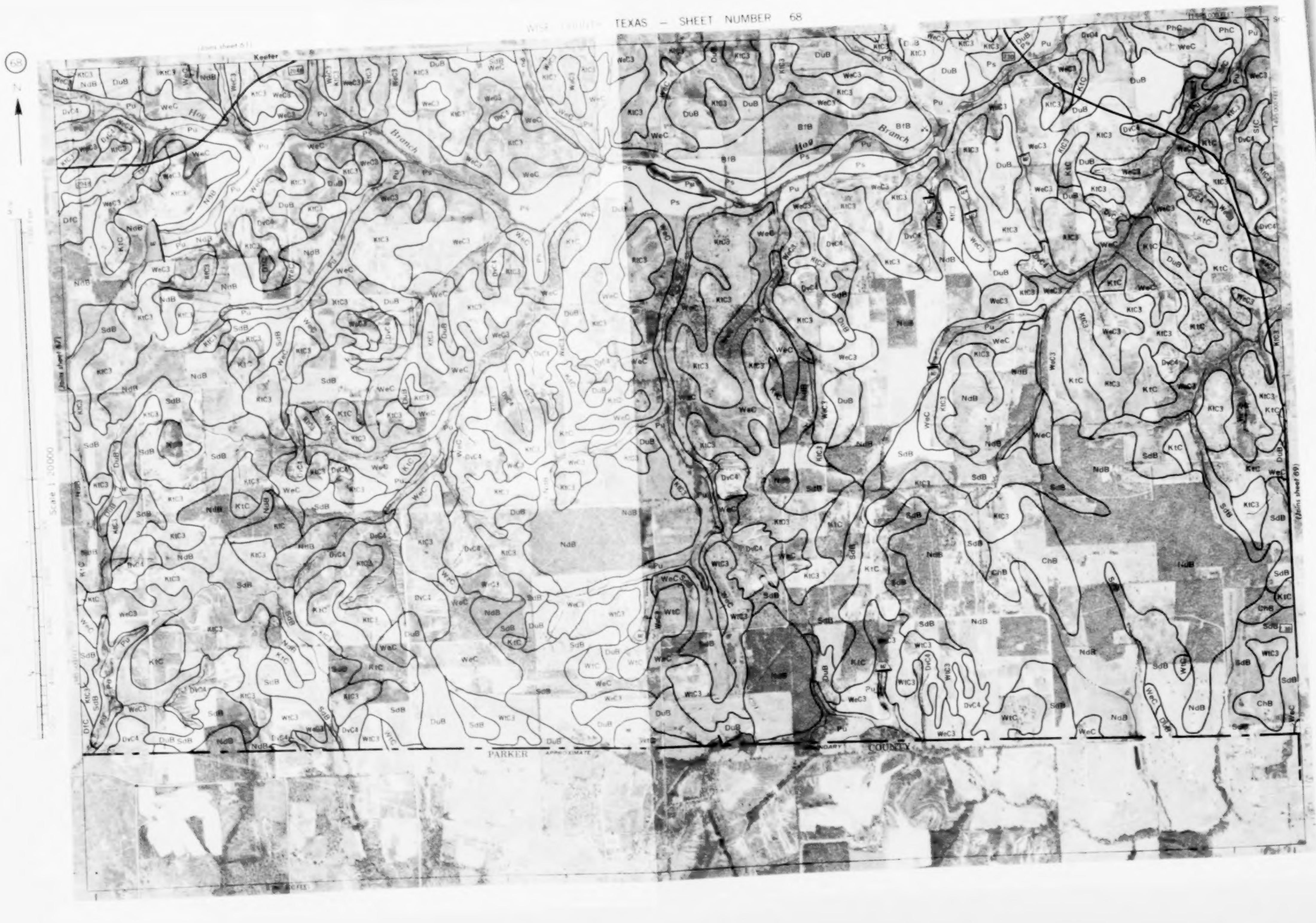

(Joins sheet 60)
N
(Joins sheet 68)
(Joins sheet 66)
Scale 1:20 000
1 Mile
5000 Feet
2 140 000 FEET
Cottonwood
Creek
Branch
PARKER
COUNTY
BOUNDARY
APPROXIMATE
51
WeC
WeC3
KtC
KtC3
WzC
DuB
DvC4
DfC
NdB
SdB
Pu
HaB
ChB
Bb
WtC3

WISE COUNTY, TEXAS — SHEET NUMBER 70

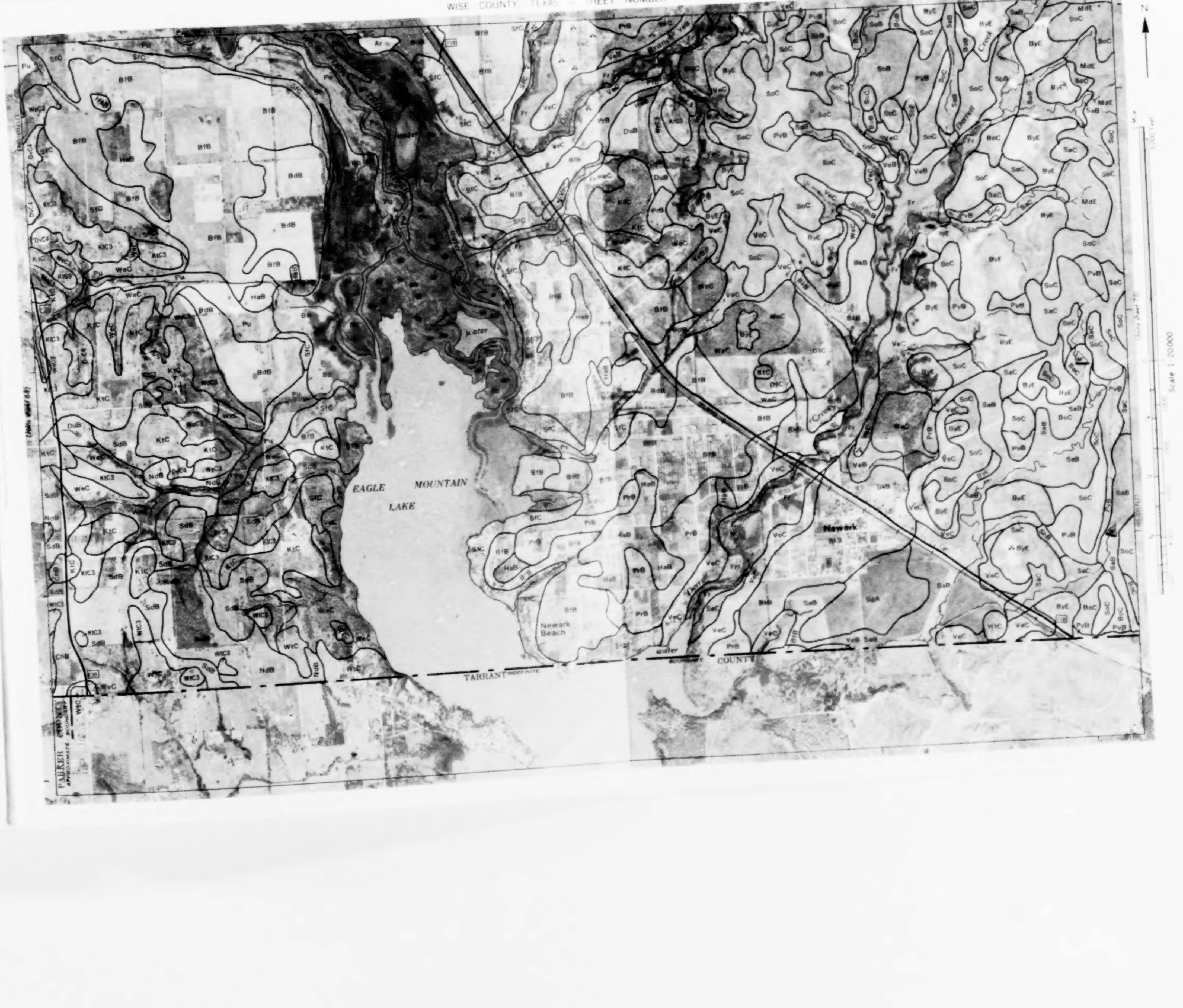

70
N
(Joins sheet 63)
(Joins sheet 69)
Scale 1:20000
1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
2 035 000 FEET
2 015 000 FEET
FORT WORTH
DENVER
Mine Branch
TARRANT
INDEFINITE
BOUNDARY
COUNTY
DENTON
COUNTY
WISE COUNTY, TEXAS NO. 70
MdE
SoC
SaC
SaB
SbB
SgB
PvB
BoC
BoB
Fr

best copy available

WISE COUNTY, TEXAS — SHEET NUMBER 68


68
N
(Joins sheet 61)
Keeler
Hog
Branch
Hog
Branch
(Joins sheet 67)
(Joins sheet 69)
Scale 1:20000
PARKER
APPROXIMATE
BOUNDARY
COUNTY

WISE COUNTY, TEXAS — SHEET NUMBER 69


(Joins sheet 62)
N
(Joins sheet 68)
(Joins sheet 70)
Scale 1:20000
EAGLE MOUNTAIN LAKE
Newark
Newark Beach
Denton Creek
water
TARRANT COUNTY
PARKER COUNTY APPROXIMATE BOUNDARY
718
BfB
BdB
SfC
WeC
KtC
KtC3
SdB
NdB
WtC
WtC3
HaB
Pu
DuB
PrB
VeC
Fr
SoC
SaB
SaC
ByE
BoC
PvB
MdE
SbB
Ar

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